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BUREAU OF FISHERIES

REPORT

OF THE

UNITED STATES COMMISSIONER OF FISHERIES

FOR THE FISCAL YEAR 1915

WITH

APPENDIXES

HUGH M. SMITH
Commissioner

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

WASHINGTON
GOVERNMENT PRINTING OFFICE
1917

CONTENTS.

Report of the Commissioner of Fisheries for the fiscal year ended June 30, 1915. (Document 827, 83 p. Issued December 24, 1915.)

The distribution of fish and fish eggs during the fiscal year 1915. Appendix I, 138 p. (Document 828. Issued March 4, 1916.)

Fish ponds on farms. By Robert S. Johnson and M. F. Stapleton. Appendix II, 28 p., 19 pl. (Document 826. Issued December 15, 1915.)

Alaska fisheries and fur industries in 1915. Appendix III, 140 p., 5 text fig. (Document 834. Issued January 6, 1917.)

Pacific cod fisheries. By John N. Cobb. Appendix IV, 111 p., 9 pl., 1 map. (Document 830. Issued October 23, 1916.)

Explorations of the United States Coast and Geodetic Survey steamer "Bache" in the Western Atlantic, January-March, 1914, under the direction of the United States Bureau of Fisheries.—Oceanography. By Henry B. Bigelow. Appendix V, 62 p., 53 text fig., 1 chart. (Document 833. Issued May 9, 1917.)

Survey of the fishing grounds on the coasts of Washington and Oregon in 1915. By Edward C. Johnston. Appendix VI, 20 p., 4 charts. (Document 835. Issued November 9, 1916.)

REPORT OF THE
UNITED STATES COMMISSIONER OF FISHERIES
FOR THE FISCAL YEAR ENDED
JUNE 30, 1915

Bureau of Fisheries Document 827

CONTENTS.

Page.

Propagation and distribution of food fishes 5
    Review of the operations 5
    Hatcheries operated 7
    Fish-cultural relations with the States and with foreign countries 11
    Propagation of the Pacific salmons 13
    Fish propagation on the Great Lakes 17
    Propagation of migratory fishes of the Atlantic streams 21
    Propagation of the trouts and basses 23
    Propagation of marine fishes 24
    Rescue of fishes from overflowed lands 26
    Acclimatization 27
Biological investigations, surveys, etc 27
    Problems of the oyster industry 27
    The home fish pond 28
    Life histories and habits of fishes 29
    Survey of fishing grounds 31
    The diseases of fishes 32
    Fresh-water mussels 32
    The fisheries laboratories 33
        Fairport, Iowa 33
        Woods Hole, Mass 34
        Beaufort, N. C 34
        Gulf of Mexico 35
    Other investigations 35
        Cultivation of the diamond-back terrapin 35
        Study of frogs 36
        Investigation of salmon 36
        Investigation of tuna 36
    Oceanographic studies 36
    Investigations of lakes 37
    Service in promotion of fishery legislation 37
Commercial fisheries 37
    The lobster fishery 37
    New England vessel fisheries 43
    The ground-fish fisheries 59
        Cod 59
        Haddock 60
        Pollock 60
        Halibut 60
    The otter-trawl fishery 60
    The mackerel fishery 62
    The swordfish fishery 62
    The New England winter gill-net fishery 63
    Newfoundland seal and herring fisheries 63
    Fresh-water mussel fishery 63
    Fisheries of Chesapeake Bay and tributaries 70
    Sturgeon fishery in Florida 70
Alaska fisheries service 70
Fur-seal service 72
Minor fur-bearing animals 74
Miscellaneous matters 75
    Movements of vessels 75
    Vessel for Alaska service 76
    New vessel for Maine coast 76
    New establishments and construction 77
    Fishery matters in Congress 78
    Publications and libraries 79
    Appropriations 81
Some needs of the service 81

REPORT

OF THE

COMMISSIONER OF FISHERIES.

Department of Commerce,
Bureau of Fisheries,
Washington, October 11, 1915.

Sir: There is submitted herewith a report giving an outline review of the operations of the Bureau of Fisheries during the fiscal year ended June 30, 1915.

PROPAGATION AND DISTRIBUTION OF FOOD FISHES.

REVIEW OF THE OPERATIONS.

The scope and magnitude of the Bureau's operations in relation to the propagation and distribution of food and game fishes, and the bearing of this work on the maintenance of the fishery resources of the nation, are indicated by the following table, which shows an output of 4,288,757,800 fish and ova, an increase of 241,000,000 over the preceding year.

The increased output was accompanied by a diminished unit cost of production and a very noteworthy increase in the number of fish reared to the fingerling and yearling stages. As improved facilities are gradually provided at the various stations, in accordance with the established policy of the Bureau, the rearing of certain kinds of fishes will be further and further extended, and the effectiveness of the fish-cultural work will thus be annually augmented. In 1915 the fish distributed as fingerlings, yearlings, and adults numbered over 58,000,000, an increase of more than 150 per cent over 1914, made up largely of salmons, trouts, and basses.

Summary, by Species, of the Distribution of Fish and Ova During the Fiscal Year 1915.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Catfishes			1,665,793	1,665,793
Carp			644,411	644,411
Yellow sucker			200	200
Buffalofish			114,849	114,849
Fresh-water drum			65	65
Shad		46,009,595		46,009,595
Alewife		4,851,000		4,851,000
Whitefish	98,900,000	405,400,000		504,300,000
Lake herring		92,350,000		92,350,000

SUMMARY, BY SPECIES, OF THE DISTRIBUTION OF FISH AND OVA, ETC.—Continued.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Silver salmon	1,948,280	21,204,230	2,756,062	25,908,572
Chinook salmon	34,466,723	44,554,892	16,741,450	95,763,065
Blueback salmon	3,155,000	43,776,741	8,666,255	55,597,996
Humpback salmon		11,758,500	479,037	12,237,537
Dog salmon		35,504,707		35,504,707
Steelhead trout	634,000	2,259,113	3,244,660	6,137,773
Rainbow trout	2,022,990	568,930	2,144,875	4,736,795
Atlantic salmon		1,804,313		1,804,313
Landlocked salmon	291,000	310,042	140,015	741,057
Scotch sea trout		58,430		58,430
Blackspotted trout	3,435,000	1,939,250	4,784,067	10,158,317
Loch Leven trout			48,000	48,000
Lake trout	12,850,000	35,294,723	3,093,745	51,238,468
Brook trout	507,150	5,700,263	6,965,167	13,172,580
Smelt	14,500,000	6,900,000		21,400,000
Grayling	350,000	1,873,000		2,223,000
Crappies			1,800,900	1,800,900
Rock bass			414,078	414,078
Smallmouth black bass		653,170	81,177	734,347
Largemouth black bass		758,300	1,431,850	2,190,150
Sunfishes		135,000	2,799,766	2,934,766
Pike and pickerel			87,846	87,846
Pike perch	326,350,000	282,820,000	383	609,170,383
Yellow perch	19,000,000	195,267,000	104,287	214,371,287
Striped bass		8,594,500		8,594,500
White perch	17,850,000	161,980,000		179,830,000
White bass			2,825	2,825
Yellow bass			420	420
Cod		260,133,000		260,133,000
Pollock		500,730,000		500,730,000
Haddock		26,814,000		26,814,000
Flounder		1,294,156,000		1,294,156,000
Mackerel		4,847,000		4,847,000
Tautog		606,000		606,000
Lobster		194,670,000	3,779	194,673,779
Total	536,260,143	3,694,281,699	58,215,962	4,288,757,804

No material changes were made in the methods heretofore employed; but through the acquisition of additional knowledge of the conditions governing practical fish culture and the attainment of greater proficiency, the Bureau was enabled to further develop the resources at its command, extending its activities into new fields contiguous to those already covered, and materially increasing its output over that of any previous year in its history. In attaining these results the funds available were not greater than those of 1914.

While there were slight decreases in the output of some of the fishes propagated, there were substantial gains in some of the more important species. A partial list of the latter class includes catfishes, whitefish, lake herring, silver salmon, chinook salmon, dog salmon, steelhead trout, rainbow trout, blackspotted trout, brook trout, crappies, black basses, sunfishes, pike perch, and yellow perch.

The output of the hatcheries devoted to the marine species of the North Atlantic coast, the commercial fishes of the Great Lakes, and the migratory food fishes of the Atlantic coast streams, which is always far in excess of the rearing capacity of these stations, was deposited on the natural spawning grounds within a few days after the hatching of the eggs. On the other hand, a considerable percentage of the salmons, trouts, black basses, crappies, sunfishes, and catfishes was reared to the fingerling or yearling stage before being distributed.

The comprehensive scope of the fish-cultural work is shown by the fact that egg collections and hatching operations were conducted in 32 States and Alaska, while the distributions reached every State and Territory. The larger part of the output is planted in public waters on the initiative of the Bureau or on the recommendation of the State authorities, but the fishes adapted for ponds, smaller lakes, and the minor interior waters are mostly consigned on individual applications. The distribution of this latter class of fishes involved railroad travel aggregating 637,716 miles, of which 146,544 miles were covered by the special cars of the Bureau and 491,172 miles by detached messengers. About 80 per cent of the railroad transportation was paid for at varying rates, but 116,665 miles of free transportation were afforded by certain companies which appreciated the advantage accruing from the stocking of waters along their lines.

Recognition of the value of the Bureau's efforts in maintaining and increasing the fish supply of public and private waters is evidenced by the widespread interest manifested in its work by people in all sections of the country. The feasibility of cultivating fish in ponds on farms is attracting general interest, and of the many thousand applications for food and game fishes received during the year fully 80 per cent called for species suitable for stocking artificially constructed ponds and natural inland waters of small area.

Notwithstanding the fact that the Bureau is annually increasing its facilities, it experiences difficulty in meeting the constantly growing demand for fish to stock the public and private waters of the interior. This applies with special force to the black basses, crappies, sunfishes, catfishes, and other fishes adapted to culture in ponds, most of which are not susceptible of propagation by the artificial means employed with the salmons and trouts, but must be produced through the natural reproduction of brood fish carried in ponds.

The expansion of the Bureau's fish-cultural operations is necessarily limited by the funds provided and the number of experienced men available for the work. Large unproductive and potentially valuable fields for the enlargement of the salmon operations exist in Alaska and the Pacific States; more extensive fish-cultural work is demanded for the maintenance of the commercial fisheries of the Great Lakes, while there are practically unlimited areas in the Rocky Mountains, Middle, Western, and Southern States which would prove of inestimable value for fish culture were funds available for developing them.

HATCHERIES OPERATED.

During the fiscal year 1915 fish-cultural operations were conducted at 50 permanent hatcheries and at 76 subhatcheries, auxiliaries, and egg-collecting stations. The stations which have been undergoing construction at Louisville, Ky., and Orangeburg, S. C., are now nearly completed, and some fish-cultural work was accomplished at each during the year. One new station has been added to the service by the partial completion of the hatchery at Saratoga, Wyo., which will soon be in condition for the propagation of fish on a small scale. A site has been selected for a fish-cultural station at Springville, Utah, and an appropriation of $50,000 has been provided by Congress to cover the purchase of the necessary land and water rights, construction of buildings, and equipment. A topographical survey of the land will be made, and the construction of the station will begin as soon as the validity of the title to the property can be passed upon by the Department of Justice. A new field station for the prosecution of the Pacific salmon work was located during the year on Quiniault Lake, in the State of Washington, and judging from the results of the initial year's operations the site will be desirable for the establishment of a permanent hatchery.

The major hatcheries operated in 1915 may be conveniently classified as follows. Included in this statement are some leased and other complete hatcheries which are operated as auxiliaries to other stations.

Location and character of operations.	Number.
Atlantic rivers, for salmons, shad, striped bass, yellow perch, and white perch	5
Pacific rivers, for salmons and steelhead trout	12
Great Lakes, for whitefish, cisco, lake trout, and pike perch	5
Interior waters, for basses, sunfishes, crappies, trouts, etc	25
Atlantic coast, for cod, haddock, pollock, flounder, and lobster	3
Total	50

Following is a list of the stations, with the subsidiary stations thereunder, the period of operation, and the species handled. The main stations, arranged alphabetically, are those for which a permanent personnel is provided by law, or which are operated more or less independently. In some cases, however, the subsidiary or auxiliary stations are completely equipped, semi-independent, and quite as important as the head station to which, for administrative purposes, they are attached.

FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1915.

Designation.	Period of operation.	Species handled.
Afognak, Alaska	Entire year	Blueback and humpback salmons.
Uganik Bay, Alaska	June	Blueback salmon.
Seal Harbor, Alaska	June-October	Do.
Baird, Cal	Entire year	Chinook and silver salmons.
Battle Creek, Cal	December-April	Do.
Hornbrook, Cal	December-May	Chinook and silver salmons and rainbow trout.
Mill Creek, Cal	November-March	Chinook salmon.
Baker Lake, Wash	Entire year	Blueback, chinook, and silver salmons.
Birdsview, Wash	do	Blueback, chinook, dog, humpback, and silver salmons and steelhead trout.
Quiniault, Wash	do	Blueback, chinook, and silver salmons and steelhead trout.
Brinnon, Wash	December-March	Dog and silver salmons.
Darrington, Wash	Entire year	Do.
Day Creek, Wash	do	Chinook, dog, and silver salmons.
Duckabush, Wash	do	Dog, humpback, and silver salmons.
Illabott Creek, Wash	do	Chinook, dog, and silver salmons and steelhead trout.
Quilcene, Wash	do	Dog, humpback, and silver salmons and steelhead trout.
Sultan, Wash	do	Chinook and silver salmons and steelhead trout.
Battery, Md	March-May	Shad, alewife, white and yellow perches.
Boothbay Harbor, Me	Entire year	Cod, flounder, haddock, and lobster.
Portland, Me	July-October; May-June	Lobster.

FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1915—Continued.

Designation.	Period of operation.	Species handled.
Bozeman, Mont	Entire year	Blackspotted, brook, lake, rainbow, and steelhead trouts; grayling; and landlocked salmon.
O'Dell Creek, Mont	Mar. 22-May 4	Grayling.
Meadow Creek, Mont	Mar. 22-May 1	Grayling and rainbow trout.
Yellowstone Park, Wyo	July-September; May-June	Blackspotted trout.
Clear Creek, Wyo	July 1-21; June	Do.
Columbine Creek, Wyo.	July 1-16; June 14-30	Do.
Cub Creek, Wyo	July 1-21; June 4-30	Do.
Lake Camp, Wyo	July 1-Sept. 10; May 12-June 30	Do.
Pelican Creek, Wyo	July 1-16; May 21-June 30	Do.
Bryans Point, Md	March-May	Shad and yellow perch.
Cape Vincent, N. Y	Entire year	Brook and lake trouts, lake herring, pike perch, and whitefish.
Three Mile Bay, N. Y	November	Lake herring.
Central Station, Washington, D. C.	Entire year	Shad, pike perch, and yellow perch.
Clackamas, Oreg	do	Blackspotted, brook, lake, rainbow, and steelhead trouts; Chinook and silver salmons.
Applegate, Oreg	do	Chinook and silver salmons and steelhead trout.
Big White Salmon, Wash	do	Chinook salmon.
Illinois River, Oreg	March	Chinook and silver salmons.
Little White Salmon, Wash.	Entire year	Chinook salmon.
Rogue River, Oreg	do	Blackspotted and steelhead trouts and chinook salmon.
Willamette, Oreg	July-June	Shad.
Cold Springs, Ga	Entire year	Black bass, catfish, and sunfish.
Harris Pond, Ga	do	Catfish and sunfish.
Craig Brook, Me	do	Atlantic and humpback salmons, brook and Scotch sea trouts.
Upper Penobscot, Me	January and June	Atlantic salmon.
Duluth, Minn	Entire year	Brook, lake, and steelhead trouts; lake herring; landlocked salmon; pike perch; and whitefish.
Grand Marais, Minn	Oct. 1-Dec. 3	Lake herring and lake trout.
Isle Royal, Mich	Sept. 23-Nov. 21	Lake trout and whitefish.
Keweenaw Point, Mich	Oct. 4-Nov. 21	Lake trout.
Marquette, Mich	Oct. 14-Dec. 2	Lake trout and lake herring.
Munising, Mich	Oct. 14-Nov. 10	Lake trout.
Ontonagon, Mich	Oct. 17-Nov. 9	Do.
Edenton, N. C	Entire year	Black bass, shad, sunfish, and white perch.
Weldon, N. C	April-May	Striped bass.
Erwin, Tenn	Entire year	Brook and rainbow trouts, large and smallmouth black basses, rock bass, carp, sunfish, and sucker.
Gloucester, Mass	do	Cod, flatfish, haddock, lobster, mackerel, and pollock.
Green Lake, Me	do	Brook and lake trouts, humpback salmon, landlocked salmon, and smelt.
Grand Lake Stream, Me	do	Landlocked salmon.
Homer, Minn	do	Black bass, buffalofish, carp, catfish, crappie, pike, pike perch, smallmouth black bass, and sunfish, white bass, and yellow perch.
La Crosse, Wis	do	Black bass, buffalofish, carp, catfish, crappie, pike, pike perch, sunfish, yellow perch, brook and rainbow trouts.
Leadville, Colo	do	Blackspotted, brook, and rainbow trouts and grayling.
Antero Reservoir, Colo	Apr. 11-May 22	Rainbow trout.
Cheesman Lake, Colo	Apr. 7-May 15	Do.
Edith Lake, Colo	Oct. 16-Nov. 9	Brook trout.
Engelbrechts Lake, Colo	Oct. 9-Nov. 21	Do.
Musgrove Lakes, Colo	Oct. 23-Nov. 20	Do.
Smiths Ponds, Colo	Oct. 28-Nov. 25	Do.
Northfield Lakes, Colo	Oct. 18-Nov. 16	Do.
Stonewall Lake, Colo	Apr. 15-May 15	Rainbow trout.
Turquoise Lake, Colo	Oct. 27-Nov. 17	Brook trout.
Wellington Lake, Colo	Oct. 15-Nov. 10	Do.
Woodland Park Lakes, Colo.	Oct. 18-Nov. 16	Do.
Louisville, Ky	Entire year	Black bass and sunfish.
Mammoth Spring, Ark	do	Large and smallmouth black basses, crappie, rock bass, and sunfish.
Friars Point, Miss	July-December	Black bass, catfish, crappie, rock bass, and sunfish.

FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1915—Continued.

Designation.	Period of operation.	Species handled.
Manchester, Iowa		Brook, lake, and rainbow trouts, pike perch, rock bass, large and smallmouth black basses, and sunfish.
Bellevue, Iowa	August-December	Black bass, buffalofish, carp, catfish, crappie, drum, pike, sunfish, white bass, yellow bass, and yellow perch.
North McGregor, Iowa	do	Black bass, buffalofish, carp, catfish, crappie, pike, sunfish, white bass, and yellow perch.
Nashua, N. H	Entire year	Brook and rainbow trouts, landlocked salmon, and smallmouth black bass.
Neosho, Mo	do	Brook and rainbow trouts, black bass, crappie, rock bass, smallmouth black bass, and sunfish.
Northville, Mich	do	Brook, lake, and rainbow trouts; grayling; landlocked salmon; smallmouth black bass.
Alpena, Mich	April-May	Lake trout and whitefish.
Bay City, Mich	Apr. 17-28	Pike perch.
Bay Port, Mich	Nov. 9-21	Whitefish.
Belle Isle, Mich	Oct. 25-Dec. 8	Do.
Charity Island, Mich	Oct. 14-Dec. 2	Do.
Charlevoix, Mich	March-April	Lake trout and whitefish.
Detour, Mich	Oct. 18-Nov. 19	Lake trout.
Detroit, Mich	April-May	Pike perch and whitefish.
Fairport, Mich	Oct. 29-Nov. 16	Lake trout.
Frankfort, Mich	Nov. 3-14	Do.
Manistique, Mich	Oct. 29-Nov. 25	Do.
Naubinway, Mich	Nov. 16-Dec. 12	Whitefish.
St. James, Mich	Oct. 29-Dec. 18	Lake trout and whitefish.
Sault Ste. Marie, Mich	April-May	Do.
Orangeburg, S. C	Entire year	Black bass.
Put-in Bay, Ohio	do	Lake herring, lake trout, pike perch, and whitefish.
Cleveland, Ohio	Nov. 29-Dec. 6	Lake herring.
Kellys Island, Ohio	Nov. 14-Dec. 8	Whitefish.
Middle Bass, Ohio	Nov. 14-Dec. 6	Do.
Monroe, Mich	Nov. 5-Dec. 10	Do.
North Bass, Ohio	Apr. 15-27	Pike perch and whitefish.
	Nov. 10-Dec. 8	Do.
Port Clinton, Ohio	Apr. 9-30	Do.
	Nov. 14-Dec. 9	Do.
Toledo, Ohio	Apr. 8-28	Do.
	Nov. 14-Dec. 9	Do.
Quincy, Ill	Entire year	Black bass, buffalofish, carp, crappie, catfish, pike perch, rock bass, strawberry bass, sunfish, yellow bass, and yellow perch.
St. Johnsbury, Vt	do	Brook, lake, rainbow, and steelhead trouts, landlocked salmon, smallmouth black bass, and yellow perch.
Darling Pond, Vt	July 21-Dec. 29	Brook trout.
Holden, Vt	Entire year	Brook, lake, and steelhead trouts, and landlocked salmon.
Lake Mitchell, Vt	July 1-Dec. 18	Brook trout.
Lake Tarlton, N. H	June 15-30	Smallmouth black bass.
Orleans, Vt	Apr. 15-June 30	Steelhead trout.
Speedwell Pond, Vt	Oct. 21-Nov. 3	Brook trout.
Swanton, Vt	April-May	Pike perch and yellow perch.
San Marcos, Tex	Entire year	Black bass, catfish, crappie, rock bass, and sunfish.
Spearfish, S. Dak	do	Blackspotted, brook, lake, Loch Leven, and rainbow trouts.
La Plant Lake, S. Dak	Oct. 15-Jan. 15	Brook and Loch Leven trouts.
Schmidt Lakes, S. Dak	Oct. 20-Dec. 25	Brook trout.
Tupelo, Miss	Entire year	Black bass and sunfish.
White Sulphur Springs, W. Va	do	Large and smallmouth black basses, brook and rainbow trouts.
Woods Hole, Mass	do	Cod, flatfish, and mackerel.
Plymouth, Mass	Nov. 23-Jan. 11	Cod.
Waquoit, Mass	Jan. 1-Apr. 15	Flatfish.
Wickford, R. I	Feb. 26-Apr. 5	Do.
Wytheville, Va	Entire year	Brook and rainbow trouts; large and smallmouth black basses, pike perch; rock bass; and sunfish.
Yes Bay, Alaska	do	Blueback salmon.
Ketchikan Creek, Alaska	September-October	Humpback salmon.

FISH-CULTURAL RELATIONS WITH THE STATES AND WITH FOREIGN COUNTRIES.

The Bureau has continued and extended its cooperative relations with the State fishery authorities, and in 1915 allotted large numbers of eggs to be hatched under State auspices and considerable numbers of young fish for planting in local waters. The States which requested this kind of aid from the Bureau number 27 and include nearly all that are engaged in practical fish culture. A list of the States, with the allotments to each, is shown in the following table:

ALLOTMENT OF FISH AND EGGS TO STATE FISH COMMISSIONS IN THE FISCAL YEAR 1915.

State and species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
California:			
Brook trout	100,000		
Chinook salmon	34,301,073		
Rainbow trout	497,240		
Silver salmon	1,913,280		
Colorado:			
Blackspotted trout	200,000		200,000
Brook trout			50,000
Delaware:			
Crappie			600
Sunfish			400
Idaho: Blackspotted trout	250,000		
Illinois:			
Black bass			4,450
Brook trout			525
Catfish			11,000
Crappie			7,400
Pike perch	15,000,000		
Sunfish			13,500
Yellow perch			3,300
Indiana: Pike perch	3,000,000		
Iowa:			
Black bass			3,240
Crappie			5,000
Pike perch	8,000,000		
Sunfish			5,000
Maine:			
Brook trout	100,000		
Lake trout	50,000		
Landlocked salmon	100,000		
Smelt		5,000,000	
Massachusetts:			
Landlocked salmon	15,000		
Pike perch	15,000,000		
Rainbow trout	216,000		
White perch	13,000,000		
Yellow perch	10,000,000		
Michigan:			
Lake trout	3,000,000		
Landlocked salmon	15,000		
Pike perch	26,400,000		
Minnesota:			
Lake trout		100,000	
Steelhead trout	100,000		
Montana:			
Blackspotted trout	400,000		
Lake trout			5,000
Whitefish	1,000,000		
Nebraska:			
Pike perch	2,000,000		
Rainbow trout			20,000
Nevada:			
Brook trout	50,000		
Rainbow trout	100,000		
New Hampshire:			
Brook trout	30,000		
Landlocked salmon	30,000		

ALLOTMENT OF FISH AND EGGS TO STATE FISH COMMISSIONS, ETC.—Continued.

State and species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New Jersey:			
Black bass			5,125
Crappie			1,050
Landlocked salmon	25,000		
Rainbow trout	100,000		
Steelhead trout	100,000		
Sunfish			2,000
White perch	4,850,000		
Yellow perch	8,000,000		
New Mexico: Blackspotted trout	100,000		
New York:			
Lake trout	100,000		
Landlocked salmon	20,000		
North Dakota:			
Black bass			900
Crappie			600
Pike perch	5,000,000		
Rainbow trout	40,000		
Ohio:			
Pike perch	247,450,000		
Whitefish	66,840,000		
Oregon:			
Blackspotted trout	500,000		51,100
Blueback salmon	3,100,000		
Rainbow trout	200,000		
Steelhead trout			27,379
Pennsylvania:			
Lake trout	100,000		
Whitefish	24,560,000		
Utah:			
Blackspotted trout	100,000		
Rainbow trout	100,000		
Vermont:			
Chinook salmon	12,000		
Lake trout	200,000		
Landlocked salmon	30,000		
Smelt	5,000,000		
Steelhead trout	200,000		
Washington:			
Blackspotted trout	400,000		
Blueback salmon	50,000		
Rainbow trout	75,000		
Steelhead trout	100,000		
Wisconsin:			
Lake trout	9,200,000		
Whitefish	6,000,000		
Wyoming:			
Blackspotted trout	700,000		
Brook trout	75,000		
Grayling	50,000		
Lake trout	50,000		
Rainbow trout	75,000		
Steelhead trout	100,000		
Total	518,469,593	5,100,000	417,569

In pursuance of the policy adopted in 1914, the Bureau is referring to the proper State officials all applications for fish not native to a given State. Moreover, it refuses to entertain applications for such fishes as the black basses, crappies, sunfishes, perches, and pikes for deposit in any of the Pacific coast lakes or streams which are inhabited by salmon or trout, or are connected directly or indirectly with trout or salmon waters. This policy, which commends itself to all who have the welfare of the fisheries at heart, has received the indorsement of the fishery authorities, the congressional delegations, and the commercial interests of the States concerned.

In compliance with official requests received from Porto Rico, Cuba, India, and Japan, consignments of rainbow-trout eggs and of various species of pond fishes were made as follows:

SHIPMENTS OF FISH AND EGGS TO INSULAR POSSESSIONS AND FOREIGN COUNTRIES, FISCAL YEAR 1915.

Country and species.	Eggs.	Fingerlings, yearlings, and adults.
Porto Rico:		
Black bass		600
Catfish		600
Rock bass		1,200
Sunfish		600
Cuba: Black bass		1,000
India: Rainbow trout	40,000	
Japan: Rainbow trout	400,000	
Total	440,000	4,000

PROPAGATION OF THE PACIFIC SALMONS.

The propagation of the Pacific salmons is the most extensive and important branch of the fish-cultural work, and the expense incurred consumes about one-third of the total appropriation available for fish culture.

Increased facilities are annually being provided at all the Pacific coast stations for the rearing of salmon to the fingerling stage before liberating them, and it is the policy of the Bureau to reduce the output of fry and increase the distribution of fingerling fish.

The salted flesh of the salmon captured for propagating purposes having been found to be a wholesome and economical food for young salmon, tons of this material were last year preserved and stored for use in connection with the rearing operations at the various Pacific coast stations. Sun-dried and mild-cured salmon have also been experimented with but are found to be inferior to the salted article. The salted salmon is soaked for a few days before using and is then placed in a hand press, which removes salt and moisture, and leaves the meat soft and flaky. Finally the material is run through a meat chopper, which reduces it to a pulp. As the young salmon take this food readily and thrive upon it, its use will go far toward solving one of the main obstacles in the way of extensive rearing operations, namely, the great cost of food.

The genuine progress that is being made in this vitally important matter is shown by the fact that in 1914 the number of reared salmon liberated was 5,764,000, while in 1915 the number was 28,642,000, of which nearly 90 per cent were chinook and blueback salmons.

Although three years have elapsed since the eruption of Mount Katmai in June, 1912, the lakes and streams on Afognak Island, Alaska, still contain large deposits of volcanic ash and sand, which greatly interfered with fish-cultural operations during the summer and fall of 1914. These deposits, constantly drifting with the currents, formed shifting bars at the mouths of the rivers, preventing the ascent of salmon to the spawning grounds or diverting their movements to other waters where conditions were more favorable. During the summer months, when the salmon runs were on and high water prevailed, the tributary streams became so badly affected with volcanic ash that days and sometimes weeks were required for the water to clear to any appreciable extent after the floods subsided.

The first blueback salmon made their appearance in the bay early in June in fairly large numbers, but severe storms occurring during the middle of the month caused the water to become thick with volcanic ash; this drove the fish to sea and delayed their movements until the following month, when they appeared in Litnik and tributary streams in greatly reduced numbers. Despite obstacles of this character encountered during the operating season, the work at the Afognak station was satisfactory, the output for the year 1915 amounting to 942,250 fry and 5,444,830 fingerling blueback salmon, and 224,000 fry and 119,480 fingerling humpback salmon. Of the 14,074,000 humpback salmon eggs collected 12,500,000 were transferred to the Washington stations for final development.

The field station established at Eagle Harbor, Kodiak Island, in 1914 proved a failure and was abandoned, but on account of improved conditions affecting the run of salmon in contiguous waters the Uganik field station was operated during the year and produced 2,500,000 eggs. Late in June, 1914, after careful investigations had been made, a field station was established at Seal Bay, on the northeast coast of Afognak Island, where there is a prospect of making large egg collections.

Improvements at the Afognak station during the year consisted in the extension of the tramway to a point on Litnik Lake, where a small wharf was constructed to facilitate the landing of launches and small boats, and the construction of a battery of 12 rearing ponds supplied with water from Ahuyon Creek.

Owing to a decline in the run of blueback salmon in the waters tributary to Yes Bay, Alaska, there was a material decrease in the egg collections and a corresponding reduction in the output of fish from the Yes Bay hatchery, which was smaller than in any year since its establishment. While unfavorable weather conditions and low water occurring during the spawning season influenced the movement of the fish to some extent, it is believed that the failure of the usual large schools of fish to reach their accustomed spawning grounds during the summer and fall of 1914 was due primarily to the operation of more traps, in which a large percentage of the salmon entering the bay are captured before the fish can reach the headwaters. The spawning season of the blueback salmon extended from September 3 to September 30. Fishing operations were conducted every day by the station crew during this period, and while no fish escaped through the racks and few spawned in the river, the total yield of eggs numbered only 41,300,000, as compared with 49,050,000 in 1914, 66,125,000 in 1913, and 72,000,000 in 1912.

The same conditions prevailed in Ketchikan Creek, where a field station had been fitted up at considerable expense for conducting humpback salmon operations. After adequate provisions had been made to intercept the spawning fish the usual large run of humpback salmon failed to appear, and consequently no eggs were secured.

On September 1 a temporary field station was established at Quadra Bay, and 2,600,000 eggs were obtained and transferred to the Ketchikan station for development. Large numbers of salmon were seen in Quadra Bay, but storms and high water occurring during the operating season, and lack of proper equipment to cope with the situation, necessitated the abandonment of the work before all of the fish could be overhauled.

As a result of the year's work 32,020,000 fry and 3,175,000 fingerling blueback salmon were distributed in local waters, and 3,000,000 eyed eggs of that species were donated to the Oregon Fish Commission. All of the humpback salmon eggs after being eyed were transferred to the Washington stations.

The completion of the electric power house and the reconstruction of the bunk house, which was destroyed by fire in 1914, were the features of improvement at this station.

Substantial gains were made in the output of all of the more important species handled at the stations in the Pacific States, and the work as a whole was attended with gratifying results.

At the Washington stations the operations for the year were very successful, the output far exceeding that of any previous year. The total egg collections of all species numbered 73,145,800, which produced 65,408,680 fry and fingerling fish, exceeding the total distributions of the previous year by 16,500,000. Of the total egg collections, 19,565,000, or nearly 27 per cent, were secured at the field station located on the Dusewallips River, a tributary of Hood Canal, 4½ miles from the Duckabush station, which was operated for the first time in 1912. The work of the station is addressed to the propagation of the silver and dog salmons and the steelhead trout.

While there was a slight falling off in the output of steelhead trout. the distribution of blueback salmon at the Baker Lake station, owing to the effectiveness of the new trap installed at the outlet of Baker Lake, was in excess of 7,200,000. There was also a large gain made with the silver salmon, while the output of dog salmon from the Duckabush, Quilcene, and Brinnon stations, on Hood Canal, was 30,705,500 or three times greater than in 1914.

The work of reconstructing the hatchery building and barn at the Baker Lake station, which were destroyed by fire in May, 1914, was undertaken during the spring of 1915, and the buildings are now nearing completion. Practically all of the fish-cultural operations at this station during the year were conducted in an improvised hatchery hastily constructed by the station employees with the material available.

At the Duckabush station the shore line of the river opposite the rearing pond system was protected by crib work and rack, to prevent the washing of the banks and inundation of the ponds during flood periods.

At the Birdsview station the old hatchery building was moved to a location across Grandy Creek, a two-room addition was made to the mess house, and a two-room cottage was constructed on the property recently acquired opposite the superintendent's residence. Extensive repairs were made to the intake dam on Grandy Creek, from which the water supply is obtained.

The results of the operations conducted at the field station located during the fall of 1914 in the Quiniault Indian Reservation were very gratifying, and from the experience thus far gained it is believed this will prove a very valuable field for the establishment of a permanent station, blueback, chinook, and silver salmons and steelhead trout being found in the Quiniault Lake and River in plentiful numbers. While the operations were conducted in an experimental way, with crude apparatus and limited facilities, the output of the station amounted to 3,558,591 blueback salmon, 19,913 chinook salmon, 198,966 silver salmon, and 10,598 steelhead trout. An outside battery of troughs with a capacity for 20,000,000 eggs was constructed and supplied with water through a flume from a spring-fed stream in the vicinity. A small three-room cottage with unfinished interior was provided for the foreman in charge, and at the close of the year preparations were being made for the extension of the hatching facilities.

Increased efforts and generally favorable climatic conditions prevailing in Oregon resulted in substantial gains in the output from the nine stations operated in that State. The total egg collections of all species numbered 70,392,674, while the distributions of chinook salmon, silver salmon, and steelhead trout exceeded that of last year. An enormous run of chinook salmon in Columbia River, which characterized the season of 1913, again made its appearance in the river in the summer and fall of 1914 at the stations on the Big White Salmon and Little White Salmon Rivers, and 47,695,000 eggs were obtained, or 3,466,000 in excess of last year's take at the same points. The handling of this large number of eggs necessitated the installation of additional hatching equipment and the shipment of large consignments of eggs to other stations for development. Eggs of the spring run chinook salmon to the number of 3,718,000, which were donated by the Oregon State Fish Commission, were hatched at the Clackamas station, and the fry, reared to the fingerling stage, were planted in Clackamas River, with a view of improving the spring run of salmon in that basin. To facilitate the rearing of salmon, a battery of seven cement ponds were constructed at the Clackamas station.

Floods occcurring during the operating season destroyed the racks at the Upper Clackamas and Rogue River stations, curtailing the output of chinook salmon and steelhead trout in those fields. Gains were made in the distribution of silver salmon where this species was propagated.

While low water and unfavorable weather conditions somewhat interfered with the movements of the fish, there was a large increase in the egg collections at all of the California stations, amounting to 38 per cent in the chinook salmon, 29 per cent in silver salmon, and 400 per cent in rainbow trout. The total collections of all species were 57,807,200, more than double those of the previous year, while the distributions of eyed eggs, fry and fingerling fish were correspondingly large. In addition to 5,000,000 chinook salmon fry, 9,053,635 fingerling fish of this species were liberated in local waters, or more than double the number produced last year.

The largest gains were made at the Battle Creek and Mill Creek stations, where the aggregate egg collections numbered considerably over 25,000,000. The summer and fall run of salmon in the McCloud River was light, although the output of the Baird station slightly exceeded that of last year. At the Hornbrook station the take of rainbow trout eggs exceeded expectations, being more than 2,600,000. As in former years, the egg collections exceeded the hatching capacity of the Bureau's stations and the surplus was turned over to the State hatcheries for development.

In order to facilitate the handling of spawning salmon and improve the water supply, the Hornbrook hatchery was moved to the north side of Klamath River, and an undershot water wheel 28 feet in diameter, with 24 buckets, was installed on the river bank 5,350 feet above the hatchery, the water being conveyed thereto through open flumes and ditches.

FISH PROPAGATION ON THE GREAT LAKES.

At the Great Lakes hatcheries the results of the work with the commercial fishes were in general satisfactory. While storms and sudden ice formation hampered fishing operations during the spawning season, the losses in some fields were in most instances compensated for by unusual success in others, and the final outcome of the collecting season was an aggregate of 1,843,493,540 eggs of all species handled as compared with 1,634,591,880 during the corresponding season of 1914. Of this total 132,000,000 represented eggs of the cisco, or lake herring, the bulk of which were secured in Lakes Ontario and Superior, where the propagation of this desirable fish was undertaken by the Bureau for the first time in the fall of 1914. The egg collections of only one species—the common whitefish—fell behind those of the previous year, the total shortage in this instance amounting to about 42,000,000. The take of lake-trout eggs, on the other hand, was over 8,000,000 in excess of that in 1914, and there was a small gain in the collection of pike-perch eggs over last year.

The lake-trout work in Lake Superior opened on September 24, and during the spawning season, which lasted 59 days, 16,247,000 eggs of good quality were secured and transferred to the Duluth hatchery. This stock was supplemented later by the receipt of 6,932,000 eggs from Lake Michigan fields, but for some reason the latter consignment was of exceptionally poor quality. On reaching the eyed stage, 500,000 eggs were shipped on assignment. The remainder produced 14,715,000 young fish, which were distributed during the spring on the spawning grounds where the brood fish were secured.

The initial attempt to propagate lake herring at the Duluth station met with a fair measure of success so far as egg collections were concerned, but the quality of the eggs was impaired by unfavorable weather conditions during the spawning season and by the rough handling to which the fish were subjected on the fishing tugs prior to their delivery to the Bureau's spawn takers. From the 32,000,000 eggs laid down in the hatchery, there were produced only 9,750,000 fry, which were returned in April to the spawning grounds in Lake Superior.

During the season there were planted in sheltered waters of Lake Superior 16.400,000 whitefish fry, which originated from a consignment of 25,000,000 eggs transferred to Duluth from Lake Erie fields and from a collection of 810,000 eggs made near Isle Royal, Mich., in the course of the lake-trout operations.

During April two lots of pike-perch eggs—one of 12,000,000 furnished by the Minnesota Fish Commission, and one of 20,000,000 green eggs transferred from the Bureau's Detroit station—were received and hatched at Duluth. The former consignment yielded 4,000,000 healthy fry, but the remaining eggs were of such poor quality that only 3,450,000 fry resulted from them. All of the pike-perch fry, as well as 426,000 young brook trout derived from eggs purchased from commercial fish-culturists, 48,500 steelhead trout fry, and 23,500 landlocked salmon fry, were distributed to applicants in Minnesota and surrounding States. The eggs of the two last-named species were transferred to Duluth from other stations of the Bureau.

Lake-trout eggs for stocking the Michigan hatcheries were obtained as usual from Lakes Michigan and Huron, the spawn-taking season extending from October 18 to November 25. Field stations established at the customary points were manned so far as practicable by permanent employees, and experienced men were temporarily employed to assist in gathering spawn on the large fishing tugs, while arrangements were made with fishermen operating gasoline boats to take the eggs themselves. The weather throughout the season was stormy and at times the wind was of such velocity that for periods of two to five days it was not possible to attend the nets. Notwithstanding this handicap the season was one of the most successful ever experienced, the aggregate egg collections being 66,424,000, nearly 14,000,000 in excess of the previous year. Of this stock 28,864,000 green and eyed eggs were used to fill applications; the remainder were incubated at the Charlevoix, Alpena, and Sault Ste. Marie hatcheries, and the fry were liberated in the immediate vicinity of these stations soon after hatching.

The gathering of whitefish spawn for the Michigan stations covered a period of two months, beginning October 14. Field stations for the purpose were located, as heretofore, in Detroit River, Saginaw Bay, and the upper part of Lake Michigan. Owing to unfavorable natural conditions, the work was only partially successful. Spawning fish were notably scarce everywhere, and especially was this true in the Saginaw Bay district, ordinarily accounted one of the most prolific sources for whitefish eggs. The work in this field was also hampered by violent winds and ice formation, which made it impossible for some of the fishermen to attend their nets during as long a period as nine days near the height of the season. The whole Saginaw Bay field is so much exposed that successful whitefish work is dependent almost entirely on weather conditions.

The former prolific fishing ground at Grassy Island, in Detroit River, which has been available for the Bureau's operations since 1899, has now been destroyed by the dredging operations of the Government for the opening of a deep waterway. At Belle Isle, the only remaining whitefish field in this river, fishing was conducted under the supervision of the State warden, who sold the stripped fish to defray the expense of his work.

The following table shows the field stations operated in Michigan waters, the period of operations, and the number of whitefish eggs secured at each:

Locality.	Season.	Number.
Belle Isle, Detroit River	Oct. 25–Dec. 8	27,340,000
Charity Island, Saginaw Bay	Oct. 14–Dec. 2	26,280,000
Bay Port, Saginaw Bay	Nov. 9–Nov. 21	180,000
Naubinway, Lake Michigan	Nov. 16–Dec. 2	10,680,000
St. James and Charlevoix, Lake Michigan	Dec. 1–Dec. 18	35,000,000
Total		99,480,000

As the egg collections were not equal to the available hatching facilities, the shortage was made up by the transfer of 117,800,000 eggs to the Detroit hatchery from the collecting field in Lake Erie, near Monroe, Mich. An assignment of 6,000,000 was deducted from the stock on hand for shipment to the Wisconsin Fish Commission and 49,280,000 eggs failed to develop. On reaching the eyed stage the 162,000,000 constituting the remainder were subdivided, 70,000,000 being retained at Detroit, and the remainder forwarded to the auxiliary hatcheries in northern Michigan, to be hatched in connection with the lake-trout eggs elsewhere referred to.

Pike-perch egg collections in Michigan waters were confined to the field off Bay City, in Saginaw Bay, the work extending over the last half of April and yielding 102,600,000 eggs. Of these 20,000,000 were shipped green to the Duluth hatchery and 12,500,000 fry were hatched and planted in various waters in the State.

The whitefish propagation in Lake Erie was satisfactory. A scarcity of fish occurred in the Put-in Bay field, and there was a shortage in the catch at Monroe Piers, owing to the destruction of some of the fishermen's nets by floating fields of ice at the height of the spawning season. The take of eggs in all other fields in this lake was greater than ever before, and the yield from some of them was twice that of the preceding year. While the aggregate egg collections, amounting to 479,290,000, were nearly 10,000,000 less than in 1914, their quality was so good that there was a decided increase in the whitefish output of the Put-in Bay station. The superior quality of the eggs is attributed partly to the supervision of the operations of the commercial fishermen by the Michigan fish wardens, who were constantly on the grounds during the spawning season, and partly to a change in the method of handling unripe fish. Heretofore it has been customary to hold large numbers of immature whitefish in pens on the spawning grounds for the ripening of their eggs, and it has been noted that a considerable per cent of the fish so held became affected by a condition known as "plugging," whereby no eggs were secured from them. This year it was determined to place no fish in the pens until they were nearly ready to spawn, and the results of this change in method were clearly apparent, the eggs not only being of a finer grade but the average yield per fish being larger than under the old system. The output from the Put-in Bay station included shipments of green and eyed eggs to the number of 235,700,000 and the liberation of 209,000,000 vigorous fry in the waters of Lake Erie.

Incidental to the whitefish operations 6,930,000 lake herring eggs were taken and hatched, the output of fry numbering 3,400,000.

Notwithstanding the fairly good results obtained with the pike perch in Lake Erie, as regards both quality of eggs and number secured, the collecting period was the shortest every known in Lake Erie. Weather conditions in the early spring were all that could be desired, thus permitting of the installation of fishing and spawn-taking apparatus in advance of the season; and while brood fish appeared in plentiful numbers near the beginning of April, none in spawning condition were taken until the middle of the month. Between that time and the end of the season, which lasted 15 days, eggs to the number of 511,715,000 were taken, the majority being obtained in the Port Clinton and Toledo fields. Of these collections 305,450,000 green and eyed eggs were furnished for stocking various State and national hatcheries, and the remainder produced 56,400,000 fry for local distribution.

Under different management fish-cultural operations were conducted on a more extensive scale than formerly at the Cape Vincent, N. Y., station, resulting in a material increase in the output of the commercial fishes of Lake Ontario. A cooperative arrangement was effected with the New York Conservation Commission for the collection of eggs of the whitefish, lake herring, and lake trout, and new fields were located and operated during the season. The Bureau was accorded the use, without cost, of the traps and nets owned by the State, and in a number of instances spawn takers who had been in the service of the State for a number of years were temporarily employed by the Bureau to take eggs for the Cape Vincent station after the State hatcheries had been filled. After a thorough investigation of the various fields, it was decided that eggs of the whitefish, lake herring, and lake trout could be procured on a more economical basis by purchasing from commercial fishermen on the same basis that was paid by the State, namely, 50 cents per quart.

The collection of whitefish eggs was undertaken at Three Mile Bay, N. Y., at fisheries operated in the vicinity of the Cape Vincent station, and at the Fulton Chain Lakes, at Old Forge, N. Y. The work was conducted in cooperation with the State employees. The egg collections at these points numbered 18,354,000, the largest part of them being from Fulton Chain Lakes, where 16,254,000 were obtained. The number of fry hatched was 18,000,000, which were planted in Lake Ontario in the vicinity of Cape Vincent.

Lake herring eggs to the number of 32,650,000 were secured in the vicinity of Three Mile Bay, N. Y., and 51,350,000 from Great Sodus Bay, at Sodus Point, N. Y. These eggs yielded 79,200,000 fry.

Lake-trout operations were conducted at Charity Shoals and Stony Island, N. Y., and at Horse Shoe Island, Amhurst Island, and Pigeon Island, Canada. Severe winds prevailed during the entire spawning season, but the results of the work were good.

Early in the spring new fields for the collection of pike-perch eggs were located at Black Lake, near Pope Mills, N. Y., and on the Oswegatchie River, at Ogdensburg, N. Y.; and while the work was conducted on an experimental basis the outcome was satisfactory, a total of 17,150,000 eggs being secured.

There were transferred from other stations to Cape Vincent for development 4,500,000 eyed lake-trout eggs and 50,000,000 green pike-perch eggs. The fry produced from all the species propagated during the year numbered 141,530,000.

A peculiarly favorable combination of natural conditions existed during the spring in the vicinity of the Bureau's Swanton station on Lake Champlain, and the work accomplished there in the propagation of pike perch was the most successful in its history. The water in the lake prior to and during the spawning season was so low that it was impossible to utilize the inclosure prepared last year for the holding of immature pike perch to ripen, but under the circumstances there was no necessity for its use.

Brood fish in very large numbers congregated early in spring at the mouth of the Missisquoi River, on which the station is located, and as the surrounding marshes where they usually spread out were dry, they ascended the main river, where seining conditions were all that could be desired. As a result of five days' fishing—from April 14 to 18, inclusive—enough ripe fish were seined from the river to more than fill the Swanton hatchery to its capacity, and it became necessary to discontinue the work at a time when the run of fish was apparently at its height. Eggs to the number of 382,800,000 were taken, of which 75,400,000 were forwarded direct from the spawning field to other stations—15,000,000 to the Massachusetts Fish Commission and the remainder to the Cape Vincent hatchery of the Bureau. The percentage of fertility of the eggs hatched, namely, 48.7, was not quite equal to that of the preceding year, but it was remarkably high when one considers the crowded condition of the hatchery and the short space of time in which the eggs had to be handled. In returning the fry to the lake special efforts were made to spread them over as wide a territory as possible, and in order to more effectively accomplish this one of the Bureau's cars was utilized for the distribution, consignments being delivered to interested parties at various places along an extended portion of the lake front.

PROPAGATION OF MIGRATORY FISHES OF THE ATLANTIC STREAMS.

A general falling off occurred in the output of the stations handling the anadromous species of the Atlantic seaboard—the shad, striped bass, white perch, and yellow perch. The decline in the run of shad in the Chesapeake Bay and tributary streams during the spring of 1915 was more marked than in the preceding year, when the run of fish was the smallest in the history of the Bureau's operations with the species.

On Potomac River experienced spawn takers attended every gill net and seine operated in the vicinity of the Bryan's Point hatchery, and a barge equipped with a battery of hatching jars, which were supplied with water by means of a gasoline pump, was stationed at Occoquan Creek, Va., with a crew of four men, to attend the seine fishery at Stony Point and the gill netters operating in that section of the river. Strong northwest winds and low atmospheric and water temperatures prevailed throughout the season. The first eggs were obtained April 21, and during the spawning season, which continued until May 13, the collections amounted to 16,012,000, from which 13,899,000 fry, or less than one-half the output of the previous year, were produced.

Good results attended the operations with the yellow perch, the 19,769 brood fish secured from the local fishermen in February producing 164,775,000 eggs, from which 151,592,000 fry were hatched, and 1,500,000 eyed eggs transferred to Central Station, Washington, D. C., for development. A feature of the yellow-perch work this year at the Bryan's Point station was the hatching of all the eggs in wire baskets swung from poles located in sheltered waters, thus obviating the expense involved in operating pumps, which is necessary when the eggs are developed in the hatchery, as has been the method heretofore pursued.

There was no improvement of conditions as regards the run of shad in Susquehanna River, and the shad operations at the Battery

Island, Md., station, which is equiped for the handling of 200,000,000 eggs, and where as many as 210,000,000 eggs were formerly secured, were a failure, only 2,866,000 being produced. The expense involved in the operation of steam boilers and pumps was reduced by the installation of a 5-horsepower gasoline pump, which was used exclusively at times when hatching operations required only a limited supply of water.

From the brood yellow perch secured on the Susquehanna River in March and April 64,933,000 eggs were obtained, which yielded 41,825,000 fry. White-perch eggs to the number of 357,250,000 were collected at the mouth of Elk Creek, near Henderson Point, Md., but large losses due to imperfect fertilization reduced the output to 175,330,000 fry. Consignments of yellow-perch and white-perch eggs, aggregating 36,850,000, were donated for development at the State hatcheries in New Jersey and Massachusetts.

The propagation of the alewife, which was undertaken in an experimental way last year, was prosecuted on a more extensive scale during the spring of 1915, with a resulting output of 4,851,000 fry.

On Albemarle Sound the climatic and other physical conditions during the spring of 1915 were identical to those of last season, which proved unfavorable to the shad operations at the Edenton, N. C. station. Although every field where there was a possibility of securing spawn was covered by experienced spawn takers, and the scope of the work was extended to fields in the lower end of the sound heretofore unoccupied, the result of the season's work shows a decrease of 6,333,000 in the output of shad fry as compared with the previous year. The 39,040,000 eggs received at the hatchery from all sources yielded 22,990,000 fry, most of which were distributed in North Carolina, although liberal plants were made in suitable waters in adjacent Southern States.

The usual preparations for propagating striped bass on the Roanoke River at Weldon, N. C., were completed early in April. Suitable traps in which to capture the brood fish and pens for holding them were located at advantageous places in the river, seven collecting points being established adjacent to grounds operated by the commercial fishermen. The prospects in April for a large run of fish were very encouraging, but early in May the river fell to a very low stage, and clear water prevailed throughout the spawning season. Abnormally high temperatures hastened the spawning of the fish, and many of them deposited their eggs in the river. Owing to excessively low water and the faulty construction of the retaining boxes, the penning operations were a failure, as many of the fish held injured themselves so badly that they died before their eggs ripened.

The first eggs were secured April 25, and from that time on collections in limited numbers were made until the end of the spawning season, on May 17, 2,500,000 constituting the largest take of a single day. The difficulty experienced last year in obtaining ripe male fish at the time eggs were available was again encountered, and large losses of eggs occurred through lack of a fertilizing medium. In one instance two females weighing 40 and 35 pounds, respectively, and carrying approximately 5,000,000 eggs, were taken in traps, but as no males were at hand, all of the eggs were lost.

The total egg collections amounted to 11,295,000, from which 6,640,000 were hatched. The discrepancy between the collections and the output was due to abnormally high temperatures, which caused a heavy loss of eggs in the hatchery.

The usual extensive Atlantic salmon operations were conducted at the Craig Brook, Me., station during the year. The brood fish collected in the summer and fall of 1914 numbered 693, of which 112 died in the pound, leaving 581 available for fish-cultural work. The 289 females stripped produced 1,954,479 eggs, of which number 1,848,000 were transferred in the eyed stage to the upper Penobscot auxiliary station during the winter for final development, and the 1,804,313 fry resulting from them were liberated in May and June in the east branch of the Penobscot River. The collection of brood fish for propagation in the succeeding fiscal year began May 21 and ended June 19, the number of brood fish secured within that period amounting to 725.

It is the opinion of the superintendent of the Craig Brook station, and also of the Penobscot River fishermen, that Atlantic salmon are as numerous this year as they have been in the past three years. The total catch in the spring of 1915 was a trifle greater than that of the preceding year, which would indicate that this species is holding its own under very adverse conditions.

PROPAGATION OF THE TROUTS AND BASSES.

Generally speaking, very successful work was accomplished during the year at the stations addressed to the propagation of the trouts and basses.

Large gains were made with the brook trout at the Manchester station, the total output being 1,080,000, as compared with 319,800 in 1914. While the average collections of brook and rainbow trout eggs were made at the Wytheville and White Sulphur Springs stations, very heavy losses of fry occurred, the mortality at the former station being due to contamination of the food supply, and at the latter to a decreased water supply, which has been falling off for a number of years.

At Leadville, Colo., where a large percentage of the eggs are collected from open waters, there was a material increase in the output of rainbow trout. The brook-trout egg collections at this station in the fall of 1914 were smaller than in the preceding year, but their quality was better and a larger number of fry were produced.

The total output of the Bozeman and auxiliary stations for the year, amounting to 17,359,436 fish and eggs, was practically 100 per cent above that of the previous year, which aggregated 8,745,538.

It is impossible to present any analysis or comparison of the Yellowstone Park work by fiscal years, owing to the fact that the spawning season of the blackspotted trout occurs in June and July, the last month of one fiscal year and the first month of the succeeding year. The take of eggs of this species in the park for the calendar year 1914 was 12,561,935. Of these eggs 11,463,000 were shipped to various other stations of the Bureau, and 560,000 fry were hatched on the grounds for deposit in suitable waters in the park, making a total distribution of 12,023,000 fish and eggs.

Owing to favorable water conditions and close application to the work, substantial gains were made in the collection of rainbow-trout and grayling eggs at the field stations located in the Madison Valley, the total output of the former species being 384,000, while 2,130,000 grayling were distributed in local waters, as compared with an output of 400,000 in 1914.

A large run of rainbow trout occurred in Cottonwood Creek, a tributary of the Klamath River, in California, much earlier in the season than usual, and while the egg collections did not come up to the anticipations based on the numbers of fish in the creek, 2,674,900 were secured, constituting the largest take ever made at this point.

The work of the 26 stations where pond fishes are propagated was conducted along the same general lines as in the past, but on account of the generally favorable climatic conditions prevailing during the spawning season of the various species, the results were unusually gratifying, material increases being made in the output of largemouth and smallmouth black basses, crappies, sunfishes, and catfishes. The distributions of the largemouth and smallmouth black basses were especially satisfactory, that of the former species amounting to 2,190,000, as compared with 822,000 in 1914, while the distributions of smallmouth black bass in public and private waters aggregated 734,000, as opposed to an output of 187,000 the previous year.

The output of the following stations is deemed especially noteworthy:

	Black basses.	Other species.
Mammoth Spring, Ark	1,226,738	512,820
San Marcos, Tex	451,657	43,765
Tupelo, Miss	330,965	84,700
Bullochville, Ga	118,145	53,370

The success of the operations was due largely to a more comprehensive knowledge of the requirements governing pond-fish culture, the adoption of more modern methods, and the promptness in making distributions.

PROPAGATION OF MARINE FISHES.

Notwithstanding the incessant storms that hampered the cod operations off the Massachusetts coast and the shortage in the take of brood fish of several of the species propagated, the work of the New England stations devoted to the cultivation of the marine fishes was in general satisfactory.

At the Boothbay Harbor, Me., station 16,482 brood lobsters were placed in the Pemaquid pound in the fall of 1914 and closely cared for throughout the winter, quantities of small pollock and herring being given them as food. When they were taken from the inclosure in April for the stripping of their eggs, it was ascertained that a larger percentage had survived confinement than in any preceding year in the history of the station, the number removed being 13,917. The lobsters were not particularly well seeded, however, as the yield of eggs averaged less than 12,000, but the total number—164,450,000—was in excess of any former year's production from impounded stock. After their eggs were removed the lobsters were turned over at the prevailing market price of 14 cents a pound to the Maine fisheries authorities, who returned them to the open waters of the ocean off the Maine coast, and later delivered to the Bureau in exchange egg-bearing lobsters of an equal value.

The collecting of seed lobsters was carried on as usual during the summer of 1914 and the spring of 1915, and from the 1,588 thus handled 34,643,000 eggs were obtained, an average of 21,815 per lobster. From the total number of lobster eggs secured during the year, 193,800,000 fry were produced and planted along the Maine coast.

The cod-fishing fleet operating off Casco Bay in March and April was small and fish were far from plentiful, and only 34,511,000 eggs were collected; these produced 21,841,000 healthy fry.

Early in April the station launches were equipped with a force of spawn takers and sent into the fields off Boothbay and Portland to collect haddock eggs from the fleet of netters operating there. While fish of miscellaneous sizes were fairly abundant, only a few large mature fish were in evidence, and only 3,584,000 eggs of poor quality were taken during the entire fishing season, which extended well into the month of May.

Beginning March 1 and extending through the month of April, men were employed to attend fyke nets set in the vicinity of Boothbay Harbor for the capture of flounders. The work with this species was only moderately successful, a smaller number of brood fish than last year being taken, while the losses of eggs during incubation were greater. The 487,250,000 eggs taken produced 394,499,000 fry.

The major fish-cultural work of the Gloucester station was addressed to the cod, pollock, haddock, flounder, and lobster, and operations with one or more species were in progress almost continuously for eight months beginning November 1, when the first collection of pollock eggs was made. During the first six weeks of the pollock spawning season, which extended to February 9, there were indications that the take of eggs would exceed that of 1914, but a series of heavy storms in December scattered the schools of fish and drove them off the fishing grounds and completely destroyed the fishermen's nets. Although 855,020,000 eggs were taken, this number was considerably less than in the previous year. Owing to a scarcity of spawning cod throughout the winter and spring on the inshore fishing grounds, the take of eggs at Gloucester was comparatively light, aggregating 82,460,000, which produced 52,250,000 fry; these were deposited in local waters with 18,030,000 fry hatched from eggs sent to the Gloucester station from Woods Hole.

The hatching of the winter flounder, which was taken up February 24, was greatly handicapped by the scarcity of brood fish, resulting from excessive fishing operations during the previous summer and fall. From the 276 spawning fish secured from the fishermen, 134,180,000 eggs were taken and 121,090,000 fry hatched and distributed.

Small collections of haddock eggs were made between March 13 and April 28, the season's collections amounting to 38,410,000, from which 25,840,000 fry were hatched and returned to the spawning grounds, the last of them being liberated on May 10.

Active fish-cultural work at the Woods Hole station began on November 27, 1914, with the delivery of 1,500 brood cod obtained from commercial fishermen. Later acquisitions brought the total brood stock of the station up to 3,068, of which 1,310 were placed in the cistern and the remainder in live cars. The steamer *Phalarope* was stationed at the beginning of the spawning season on the fishing grounds near Plymouth to collect eggs from any ripe cod which might be taken by commercial fishermen, but severe weather and fogs so hampered their operations that most of the fishermen left the grounds at an early date; consequently the total receipts of eggs from that field amounted to 7,663,000. These, added to the eggs secured from brood fish held at the station, gave a total of 270,504,000, of which a consignment of 24,630,000 was transferred at the height of the collecting season to the Gloucester station. From the remaining 245,874,000 eggs, fry to the number of 168,012,000 were hatched and liberated in the coastal waters of Massachusetts.

The first brood flounders were received at the station on January 16, having been taken in fyke nets set in the immediate vicinity. A few days later captures of ripe fish were made at the field station at Waquoit Bay, and on February 26 collections were undertaken at Wickford, R. I. The fairly favorable weather conditions for the work during the late winter permitted the collection of 1,053,285,000 eggs, or about 15 per cent more than that of the previous year. The average fertility of the stock was somewhat below the average, but this handicap was offset to a considerable extent by the uniformly suitable water temperatures prevailing during the hatching season, and the final outcome of the work with this species was the distribution of 778,567,000 fry on the spawning grounds along the Massachusetts coast.

At the close of the flounder work the station was fitted up for the propagation of such summer-spawning fishes as might be secured from surrounding waters, and small quantities of mackerel and tautog eggs were taken and hatched.

RESCUE OF FISHES FROM OVERFLOWED LANDS.

One of the most important branches of the Bureau's operations is the rescue of young food fishes from the lakes and bayous formed by the overflow of the Mississippi and Illinois rivers and their tributaries. In the fiscal year 1915 operations of this character were conducted at the stations located on the upper Mississippi River at La Crosse, Wis., Bellevue and North McGregor, Iowa, and Homer, Minn.; on the Illinois River, at Meredosia, Ill., and on the lower Mississippi River at Friars Point, Miss.

Favorable water stages made it possible to operate these stations from the receding of the floods in July until the latter part of December. The total collections of all species of river fishes numbered approximately 8,357,000. Of this number 551,000 were delivered to applicants and deposited in public waters, the distributions involving 34 carloads of fish, in addition to the deliveries made by detached messengers. Fishes of all species to the number of 7,806,000 were rescued from landlocked waters in the vicinity of the fields of operation and returned to the main rivers. The output for the season is regarded as satisfactory, the distribution being three times as large as last year.

As has been explained in previous reports, the many hundreds of thousands of young fishes resulting from the Bureau's seining operations along these rivers are taken from landlocked bayous and lakes where they would perish from drought, or from cold later in the year, if allowed to remain. Of the total number of fish collected, fully 90 per cent are returned to the rivers where they originated.

ACCLIMATIZATION.

In continuance of the efforts to establish the Atlantic lobster on the Pacific coast, a shipment consisting of 6,000 adult lobsters—3,100 females and 2,900 males—was forwarded in a refrigerator car on November 16 from Boothbay Harbor, Me., to Anacortes, Wash. The lobsters were packed in crates, as heretofore, between layers of rockweed, and while en route were daily sprinkled with salt water, an even temperature of 40° F. being maintained during the entire trip. Through an error of the express company in routing the car, the trip was made 250 miles longer than necessary and a delay of 24 hours in delivery resulted. On the arrival of the car at Anacortes the loss en route was ascertained to have been 1,051 female and 1,345 male lobsters. Owing to the weak condition of a portion of the survivors 865 females and 739 males were planted in suitable places in the harbor off Anacortes, and the remainder of the consignment was transferred to live cars anchored in Puget Sound and allowed 24 hours in which to recuperate. The following day, after delivering 100 at Anacortes, for shipment to Japan, the lobsters were towed to Deer Harbor, in the San Juan Islands, Puget Sound, and liberated in good condition.

In November, 1914, a third consignment of 7,000,000 eyed humpback salmon eggs was forwarded from Puget Sound to New England and divided equally between the Craig Brook and Green Lake hatcheries. The fry resulting from them, 4,964,757 in all, were distributed in various tributaries of the Penobscot River and other selected streams.

BIOLOGICAL INVESTIGATIONS, SURVEYS, ETC.

PROBLEMS OF THE OYSTER INDUSTRY.

Of all American food products derived from the water, the oyster merits first consideration. In nutritive qualities it is surpassed by none; in the total value of the product marketed and consumed the oyster ranks first; no fishery resource is more widely distributed on the seacoast; and none lends itself to artificial cultivation so readily as the oyster. In certain regions oyster growing has reached a very high degree of development, and it may be cited as the only fish-cultural industry which has been largely developed through private enterprise. Nevertheless, the industry is yet quite too restricted in comparison with the wide distribution of the oyster, and with the extent of the barren bottoms that could be made productive through human efforts.

The natural development of commercial oyster culture is seriously hampered both by peculiar conditions of an economic nature, and by the failure to apply scientific methods in an adequate way to many of the elementary problems involved. The Bureau has endeavored at all times render all practicable aid to this important industry and to awaken a merited interest in the subject on the part of the public, of State officials, and of all persons engaged in the industry.

In continuation of its practice of cooperation with State authorities, and in accordance with the authorization and direction of Congress, the Bureau has during the past fiscal year conducted a survey of the Apalachicola Bay, Fla. The steamer *Fish Hawk* and qualified assistants from the central office were engaged in the investigation, the purpose of which was to determine the extent of the natural oyster beds and of the bottoms suitable for the production of additional quantities of oysters through methods of culture.

In addition to utilizing the services of its permanent assistants in such efforts, the Bureau has engaged the temporary services of qualified investigators at one of its laboratories in attacking problems of vital importance to the welfare of the oyster industries. Among these problems there may be mentioned that presented by the condition known as "greening," which, to a more and more serious degree, is manifesting itself in certain important oyster regions with the effect of rendering the oysters unmarketable. Other investigations relate to unsolved problems of propagation and of fattening of oysters.

The possibilities of a higher development of oyster culture on the Pacific coast are receiving attention, and the Bureau has engaged the temporary services of an investigator whose studies are now directed to acquiring the necessary knowledge of the life history and conditions of development of both the native and the introduced Eastern oysters.

Although these investigations have not yet reached a stage justifying a published report, the progress is so encouraging as to demand the continued application of available means to these investigations. It has been urgently recommended that special and adequate provision should be made, so that the success of the efforts of the Bureau may not be contingent upon the use of temporary agents who can devote but a few weeks of the year to studies that are of vital importance to a national industry.

THE HOME FISH POND.

In certain phases the fisheries have already passed from the condition of exploitation of natural resources to one of at least partial dependence upon methods of artificial propagation, and yet, in this country at least, the principle of communism largely controls. A striking exception is elsewhere alluded to in connection with the important industry of oyster culture, or commercial oyster farming. There are many evidences of increasing interest in the rearing of fish in small ponds on the farm. Whatever may be said of the commercial possibilities of such a practice, there is no question but that a desirable and convenient addition to the food supply of the home may thus be provided with inconsiderable expenditure of money or labor, and with collateral advantages that are not insignificant. In every way possible the Bureau places its accumulated experience at the disposal of the persons interested. It desires to do more than this, however, and, through the only one of its biological stations that is suited to the purpose, it is attempting to conduct experiments and investigations that will bear directly upon the practical problems confronting the owner of a home fish pond. Such experiments can be imposed upon the biological station at Fairport, Iowa, not only without hampering its primary functions in the propagation of fresh-water mussels, but in a way to materially further that object. In connection with the experimental fish culture there is accumulated a store of experience, but there is also made available a surplus stock of young fishes which may be used in the propagation of mussels.

Some of these experiments are being conducted with such favorite fishes as the bass and bream. An important one undertaken during the past fiscal year is the rearing of young buffalofishes from eggs artificially fertilized and hatched. While the larger number of the buffalo fry were liberated in the Mississippi River soon after hatching, a pond of about an acre in extent was stocked with 180,000 of these fish as the beginning of an experiment to determine the feasibility of rearing them in artificial ponds. This is not known to have been attempted before, but the Bureau is gratified to record that at the close of the fiscal year the results are quite encouraging. These experiments in the artificial propagation and rearing of the buffalofish are to be regarded as of particular importance, since this species is a valuable commercial fish that is regularly diminishing in numbers in the public waters. As a pond fish it has the advantage of attaining a large size, of being without cannibalistic tendencies, and seemingly adapted for practicable methods of artificial feeding.

The results of such experiments will be of value not only in pointing the way for more effective conservation of the fish in public waters, but also by giving due encouragement and assistance to those who would utilize privately owned waters for the production of fish food. The fish-cultural work at this station will be extended as additional ponds may be constructed.

LIFE HISTORIES AND HABITS OF FISHES.

It is manifest that in order to arrive at intelligent conclusions regarding the necessities and the proper modes of protection of marine fishes, and to determine the possibilities of promoting an increase through artificial propagation, it is essential to have a reasonably complete knowledge of their life histories and habits. The problem is easily stated, but the solution offers peculiar difficulties. One can not casually walk along the shores and observe the activities and the propagation of fishes. Systematic plans of study must be evolved so that the fishes are collected and observed at various places and during the different seasons. In the end a variety of methods of collecting and of study must be followed. The eggs and the larval fishes and the adults are not all obtained at the same time or by the same forms of apparatus. Chance, indeed, plays an important part in the investigations. The eggs or the larvæ may be obtained free in the water before the adult fishes are found in the condition of breeding. It is necessary to be able to identify the small forms whenever they are found, but familiarity with the adult fishes does not enable one to do this. The young are generally so dissimilar to the adults that eggs or larvæ of a common fish may be discovered, studied, and figured without determining the species of its parentage. This explains why it is necessary to undertake systematic studies of all larval forms obtainable, and to follow, as opportunity offers, the life history of every available fish. When once a study has been carried out in a sufficient way, it will become possible to recognize any species of fish in any form in which it is encountered, and then the data gathered from systematic collecting can be intelligently collated and used as a basis for correct inferences regarding the migrations and life histories of important fishes.

The Bureau has been attacking this general problem in a serious way, and will continue to do so with the assurance that after a term of years sufficient knowledge will have been gained to remove some of the most palpable obstacles to its more effective service for the conservation and propagation of valuable food-fishes. During the early part of the fiscal year one of the regular assistants and a temporary investigator were engaged in such an investigation of the larval development of fishes at the Beaufort laboratory. In order to extend the territory of observation the investigation was resumed at Woods Hole in June, 1915, but the opportunities for collecting were found to be inferior to those at Beaufort. The director of the Beaufort laboratory was enabled to make observations during the winter season which throw light upon the breeding habits of such important fishes as the "gray trout" and the mullet. Additional material for study is obtained in connection with the oceanographic observations of the schooner *Grampus* and the steamer *Fish Hawk*.

The same problem is being attacked from a different angle through a study of the markings of the scales of fishes, since recent scientific investigations have shown the possibility of ascertaining the age and of making certain inferences regarding life histories from the form and arrangement of the minute markings on the scales.

Such studies have not been confined exclusively to the marine species. A series of studies of the fresh-water fishes of the Mississippi River was in progress in Lake Pepin, but it has suffered temporary interruption through the transfer of the scientific assistant in charge to become director of the biological station at Fairport, Iowa. In connection with the same station, one of the permanent assistants has been detailed to Keokuk, Iowa, during a considerable portion of the year. The presence of the dam across the Mississippi at this point creates a favorable condition for certain sorts of studies of the movements and habits of fishes. It is the desire of the Bureau to continue systematic observations in this region, not only for the purpose of gaining additional knowledge of the habits of fishes, but also with the object of learning from actual experience what is the effect of water-power developments upon the general condition of fish life in the larger rivers.

An important field of study relates to the food of fishes. It is evident that the abundance of fishes in any body of water must be limited by the amount of available food. All fishes do not take the same sorts of food, nor does any given species of fish subsist upon the same kind of food at all stages of its existence. Furthermore, since fish do not lay by stores of food in time of plenty, excess at a particular season will not tide the fish over too extended a period of scarcity. It may then be said that the abundance of any fish is limited by the minimum quantity of its food present at the time when it is required. The Bureau finds itself unable to undertake extended series of investigations of the food of fishes, but, as an effort in the right direction, it has secured the temporary services of a competent investigator at Madison, Wis., for the study of the food of a selected species throughout the entire year.

In this connection, reference should be made to the continuation of the practice of giving encouragement and financial aid to specialists in the prosecution of sytematic studies of certain groups of aquatic animals and plants. Studies of this nature now in progress at the Beaufort laboratory relate to the protozoa and to the diatoms, very low forms of animals and plants, respectively, but forms that play a very significant part in the economy of aquatic life, and which in various direct and indirect ways bear upon the fortunes of life of the larger animals.

SURVEY OF FISHING GROUNDS.

It was expected that the examination of the fishing banks off the coasts of Washington and Oregon, which was begun in the preceding fiscal year, would be reinstituted early in July, but the *Albatross*, which had been used for the purpose, was unexpectedly detained in Alaska and could not commence the work until August 27, and the onset of stormy weather caused it to be discontinued on September 10. The interval between July 1 and the beginning of the *Albatross* operations was occupied in conducting the investigations by means of chartered boats operating from the shore. The results of the survey were very satisfactory, several new small halibut grounds being discovered and a previously little known bank off Newport, Oreg., being thoroughly examined. It was found that halibut were present in this region in paying quantities through at least part of the year, and, in consequence of the investigation, the attention of the fishermen was attracted to this fact, and a small but profitable fishery was inaugurated. The activities of the fishermen thereby induced in this region have resulted in the discovery of other grounds, particularly one lying off the mouth of the Columbia River in an area between the zones covered by the *Albatross* survey. It is not expected that the banks already discovered, and probably not those which may be found in the future, will in any way equal in extent and productiveness those in Alaska, but there appears to be no doubt that they can furnish a considerable supply of fish readily accessible to the primary markets. In June, 1915, about 40 per cent of the halibut landed at Seattle came from these grounds. The deficiency of funds made it impossible to undertake this survey when the weather was favorable in the spring of 1915, but at the close of the fiscal year the *Albatross* was under orders to proceed with the work as soon as possible after the first of July.

During the preceding fiscal year the Bureau published an economic circular calling attention to the opportunities for a large blackfish fishery offshore from North and South Carolina. While the blackfish grounds are very productive they are very restricted in area. During the past fiscal year the Bureau has detailed the steamer *Fish Hawk* to continue the survey with the object of determining the full extent of the grounds. The survey was in progress at the close of the fiscal year. Through the assistance of the Bureau of Lighthouses a permanent buoy was placed upon the principal grounds known and described as the Beaufort offshore fishing grounds, in the hope that such a mark would aid and stimulate the local fishermen who might be without the equipment or the experience to enable them to locate such a circumscribed area by methods of navigation.

THE DISEASES OF FISHES.

It is not generally realized to what extent fishes are subject to parasitism and to what degree their existence is contingent upon the less obvious factors of environment. Without presenting the conspicuous features of an epidemic, certain of the ever-present parasites may so reduce the vitality of individual fishes as to cause them to fall an easier prey to voracious enemies. Deleterious chemicals may be introduced into the water, not only through evident sources of pollution, but through very indirect, unintentional, and ordinarily unobservable means. Furthermore, the effect of the introduction of chemicals or of commercial waste products, or of natural débris, when it is without direct poisonous effect, may give rise to such chemical reactions in the water as to render the environment unsuitable for the support of fish life.

With the services of temporary investigators at its various laboratories the Bureau has made special efforts to investigate the effects of various sorts of pollution, to study the forms and the life histories of the different kinds of parasites, and to determine the modes of transmission of infection. The general object has been to lay such a foundation of familiarity with the facts as to be able to determine the means of control. The Bureau receives a large number of reports and inquiries from the public relating to the occurrence of unusual conditions of mortality among the fishes both in private and in public waters. Such matters are of proper concern to the Government, and every possible effort has been made to render appropriate service.

In the lack of any permanent assistant qualified in the study of such matters, and familiar with the practical conditions involved, the Bureau has been seriously hampered in its effort to do justice to the demands made upon it. This deficiency will not be felt in the future as in the past, since Congress has made provision for the employment of a competent assistant to serve as fish pathologist.

FRESH-WATER MUSSELS.

The propagation of fresh-water mussels shows continued development. The number of larval mussels planted was 344,655,260, an increase of 50 per cent over the output of the preceding year. In connection with the mussel propagation, 32,650 adult and 15,083 fingerling fishes were rescued from overflow ponds. As the result, partly of greater efficiency and partly of somewhat more favorable weather conditions, the unit cost was still further reduced, being 2.7 cents per thousand glochidia planted, as compared with 4.3 cents per thousand in 1914 and about 7 cents in 1913. Experiments are also being conducted to determine the feasibility of rearing certain valuable species of fresh-water mussels in crates or in ponds, and an encouraging degree of success marks the progress of the experiments during this year. Thus, a few fishes were infected with glochidia of a species of mucket from Lake Pepin, and placed temporarily in a floating basket in the river at Fairport. Over 200 young mussels developed in this basket, where they were retained during the entire fiscal year. Other mussels were reared in an open pond and some in small aquaria. In the two experiments in the river and in a pond a very rapid growth occurred, some individuals attaining a length of more than 1 inch in the course of about five and one-half months' growth.

The Bureau is utilizing the excellent facilities at the Fairport station in the prosecution of several problems that are of direct importance to the mussel industries. Experiments have been conducted to determine the effect upon the mussel beds of some of the common instruments of capture; the possibility of the utilization of mussel meats is under investigation; the study of the nature and cause of pearl formation has been continued; and especial attention is given to the important problem of the relation of the fresh-water mussels to the various species of fish that serve as hosts during the period of parasitism.

An investigation of the mussel resources of the Ohio River was begun before the close of the preceding fiscal year, and continued until the fall of 1914. The results of the field observations are now being compiled to be made public as soon as possible. A brief examination of the mussel beds of the Tensas River, La., made in November, 1914, revealed the presence of considerable quantities of mussels of medium quality, and a circular was promptly issued embodying a report of the observations. A similar examination was made of mussel beds in a portion of the Apalachicola River of Florida. The shells were of excellent appearance, but will require to be carefully tested for commercial qualities; the tests could not be executed before the end of the fiscal year.

THE FISHERIES LABORATORIES.

Fairport, Iowa.—The biological station at Fairport, Iowa, was complete in its essential features and the main laboratory building was opened for permanent occupancy in June, just preceding the beginning of this fiscal year. At all stages in the construction and organization of this station the Bureau has had reason to feel gratified at the sympathetic public interest which has been manifested in its intended service. The establishment of the station was authorized by Congress in 1908, and its construction was begun in the following autumn. Within a few months a temporary equipment was ready, and the experiments in mussel propagation began in June, 1910. The propagation of mussels on a practical scale was entered upon in 1912. During the following year the laboratory building was completed. At the time of the actual opening of the building in June, 1914, there were urgent local requests for a formal celebration of the opening with exercises of dedication, and such an occasion was authorized to be held on August 4, 1914. The attendance of some 5,000 persons coming from various distances, the sympathetic addresses by men of prominence in public life and by scientific men of established repute, and the presentation of a memorial tablet, were regarded as exceptional manifestations of public interest, and as a gratifying indorsement of the purposes of the Bureau as expressed by this new endeavor.

This station will not only render valuable service in the propagation of fresh-water mussels and the conduct of investigations relating to these resources, but it will be the means of keeping the Bureau in closer touch with the fishery problems of the Mississippi Basin, for which it may serve as a center. The possibilities and the duty of linking fish-cultural experiment work with mussel propagation has already been discussed, and the Bureau thus finds itself with some equipment which had not otherwise been provided for a phase of service to fish culture and fisheries that is of the broadest general significance.

The various activities of the Fairport station are discussed under the several headings of "Fresh-water mussels," "Home fish pond," "Life histories of fishes," and "Parasites of fishes."

Woods Hole, Mass.—The fisheries laboratory at Woods Hole has been open as usual during the summer season. Its relatively extensive equipment makes it an especially favorable place for the prosecution of the more technical investigations, while its intermediate location between the great oyster grounds of Long Island Sound and the fishery ports of the eastern coast makes it a convenient center for investigations in the interest of the fisheries of that territory. Some of the studies pursued at the Woods Hole laboratory during this year were concerned with the oyster, with the life history and food of fishes, and with the parasites of fishes, subjects that are referred to elsewhere in this report. Other inquiries relate to the utilization of waste fishes and of other aquatic forms that do not now enter into commerce, with the oxygen requirements and the metabolism of fishes, and with the effect of various mineral salts which are introduced into the waters either through direct and indirect means of pollution.

The Woods Hole laboratory is the oldest station of the Bureau. Its history and its public service are closely linked with that of the Bureau and the earlier Fish Commission for which it once served as temporary headquarters. After more than 30 years of usefulness the laboratory building and equipment are not in a commendable state of repair. It is desirable that suitable provision be made for its renovation.

Beaufort, N. C.—The buildings and grounds of the Beaufort laboratory have been improved during the fiscal year, the additional work being rendered possible by special appropriation. The formerly uneven and sandy surface of the island has been graded to an approximate level and given a thin covering of rich soil. Several kinds of grass have been planted with a view to protection from the annoyance and possible losses due to wind driven sand. A slight extension of the area of the island occurred through the dumping of materials obtained from the dredging operations carried on in Beaufort Harbor under the War Department.

Space for storage of coal was provided in connection with the pump house, so that the coal shed could be converted into a boat house and thus provide much needed facilities for the repair and repainting of the station boats. Additional concrete inclosures were provided for experimental work. A large salt-water pump was purchased, making it possible to maintain an adequate supply of sea water, while reducing the hours of pumping to a fraction of the time formerly required.

A good deal of work was done on the laboratory building. A new roof of slate was applied, the wood piles supporting the building were replaced by brick piers; the salt-water plumbing was renewed; 48 defective window frames were replaced by new frames; two additional rooms were formed by partitions which cut off portions of the large museum space on the first floor; the walls and interior wood work were renovated with calcium and varnish; and the appearance of the building was much improved by the addition of upper porches on the front similar to the porches originally provided on the rear of the building.

The several activities of this laboratory have previously been detailed in connection with the studies of the terrapin, the habits and life histories of fishes, the survey of fishing grounds, and the study of parasites of fishes. Another important investigation which has been in progress during the past two years has to do with the protection of wood against marine borers.

The serviceability of this station would be greatly enhanced were it provided with an adequate scientific staff so that investigations of important economic bearing might be continued throughout the year. Under present conditions, when the station must depend for its staff largely upon the temporary employment of scientists from the universities, the period of activity must be confined largely to the summer months.

Gulf of Mexico.—A previous Congress provided for the construction of a marine biological laboratory on the Gulf of Mexico, to be located upon the coast of Florida and on lands to be donated to the Government. A site has been selected at Key West and the present owners are putting the grounds into a shape suitable for acceptance by the Department. It is supposed that the transfer of title will be effected in the early part of the next fiscal year. An additional appropriation is needed before the station can be constructed.

OTHER INVESTIGATIONS.

Cultivation of the diamond-back terrapin.—Previous reports have referred to the successful progress of the experiments in terrapin propagation. The main fact having been previously demonstrated, that the terrapin can be successfully reared in confinement, the experiments have been continued to gain additional knowledge and thus assure the greater measure of success in propagation. It is interesting to record that the terrapin of the brood of 1909 have now completed the life cycle, so that eggs were obtained this past spring from terrapin which were hatched from eggs laid in the experimental pounds in 1909. The breeding terrapin were thus 6 years of age. Since 1909, however, the practice of winter feeding for the young terrapin has been initiated, so that the rate of growth during the first year has been practically doubled. During the past winter a change of food was adopted with the result of still further accelerating growth. The longer the investigation has been continued the more encouraging have been the results. Further experiments are now in progress to determine the proper proportions of the sexes in breeding, the best conditions for hatching, the possibilities of cross and selective breeding, and the prevention of mortality. Since the yearly hatch in the experimental pounds is now much larger than is required for the continuation of the work, the Bureau liberated in the marshes of Beaufort Harbor in September, 1914, 876 yearling terrapin.

Study of frogs.—The correspondence of the Bureau reveals a very widespread interest in the subject of frog culture. Many ventures in the rearing of frogs for commercial profit have been made, but it does not appear that the results generally obtained have represented a distinct improvement over the natural conditions. Since the edible frogs are prolific breeders by nature and since the young will develop under a variety of conditions in pools and marshes, it appears evident that the problem of frog culture is not one of manipulation of the eggs, but rather one of providing such an abundance of food that a large proportion of the young may come to maturity and a desirable rate of growth be secured. During this fiscal year the Bureau has secured the services of a skilled investigator who will conduct a careful inquiry into the feeding habits, rate of growth, and conditions of existence of the commercial species of frogs.

Investigation of the salmon.—The study of the life history of the salmon of the Sacramento and Columbia rivers has been continued throughout the fiscal year. Just before the close of the year arrangements were made for further investigations of the breeding habits of the salmons in the hope of gaining knowledge of practical utility in the conservation and propagation of these fishes.

Investigation of the tuna.—Within the past few years there has developed a very important industry in the canning of tuna on the Pacific coast. The product has already won a place of high esteem and a new fishery resource is thus discovered. Unfortunately for the highest development of the industry, the tuna can not be counted upon to appear in abundance with any regularity, and the conditions which induce the appearance or disappearance of the fishes are not understood. It ha sbeen the desire of the Bureau to investigate the habits of this fish in a thorough way and to follow their movements upon the open sea. Through the services of a temporary assistant a preliminary inquiry was conducted, and a number of fish were marked in the hope that some of them may be recovered at a later time and light thrown upon their migrations and rate of growth. An adequate investigation could be conducted only with the use of a seaworthy vessel, such as the *Albatross*. The limited funds available for the operation of this vessel and the fact of other and prior demands for its services made it impracticable to make a suitable disposition for continuance of the inquiry.

OCEANOGRAPHIC STUDIES.

The important oceanographic work carried on by the Bureau partly upon its own resources and partly in cooperation with the Coast Guard Service, was detailed in the last annual report. During the present fiscal year an assistant from the Bureau has been regularly detailed for oceanographical observations upon the revenue cutter *Seneca* engaged in ice patrol and observation on the trans-Atlantic steamship lanes. From May 4 to the close of the fiscal year the schooner *Grampus* has been regularly employed in oceanographic observations off the coast of New England. The observations are of value in determining the conditions of temperature, densities, ocean currents, and other physical factors that affect the distribution, migration, and successful propagation of fishes; particular attention has also been given to the collection of material which would contribute to a knowledge of the life histories and habits of important food fishes.

INVESTIGATION OF LAKES.

The Bureau has continued to cooperate with the State Geological and Natural History Survey of Wisconsin in an investigation of the fundamental biological and physical conditions of life in inclosed waters. The examination of Lake Champlain, which was commenced in the preceding year, was brought nearly to completion, and a report is expected to be ready in the course of the next fiscal year.

SERVICE IN PROMOTION OF FISHERY LEGISLATION.

While the Bureau is charged with the duties of propagating fishes and of conducting investigations in relation to the fishes and the fishery industries, it has a natural obligation and desire to give encouragement and advice in the matter of legislation whenever its aid is solicited. Within the year a number of occasions have arisen in which the Bureau could cooperate with State authorities in the consideration of measures of protection or conservation. The Bureau has been represented in such conferences with the authorities of the States of Florida, Georgia, and North Carolina, and has also participated in a joint conference of the State officials of Wisconsin, Minnesota, Iowa, and Illinois with respect to mussel legislation. In many directions our fishery resources are being wasted through the inadequacy of the efforts for protection or conservation, and every judicious step toward the desired ends is deserving of the most cordial indorsement.

THE COMMERCIAL FISHERIES.

With the small field force available, the Bureau has made canvasses of certain branches of the fishing industry, and through local agents has continued and extended the collection of data for important offshore vessel fisheries of both the Atlantic and the Pacific coasts.

THE LOBSTER FISHERY.

A canvass of the lobster fishery of the entire Atlantic coast was completed during the year, and a one-sheet bulletin giving the results of the canvass was issued and widely distributed. The lobster fishery has been attracting much attention because of its critical condition in some States, and in the next few years will undoubtedly receive unusual consideration at the hands of persons having concern for the welfare of this valuable industry.

Lobsters are caught along the entire coast, from the most eastern point in Maine to the Breakwater at Lewes, Del. The number of persons engaged in the fishery in 1913 was 4,508, and the total investment was $2,460,898. The catch amounted to 8,832,017 lobsters, weighing 12,067,017 pounds and valued at $2,394,822. The details of the fishery in each State are shown in the following table:

LOBSTER FISHERY OF THE ATLANTIC COAST STATES IN 1913.

States and counties.	Persons engaged.					Vessels fishing.			Vessels transporting.			Boats.	
	On vessels fishing.	On vessels transporting.	In shore or boat fisheries.	In wholesale establishments.	Total.	Number.	Net tonnage.	Value.	Number.	Net tonnage.	Value.	Number.	Value.
Maine:													
Washington	4	11	534	9	558	2	10	$740	5	50	$11,800	499	$80,040
Hancock	26	32	604	1	663	13	85	8,260	15	160	25,800	564	133,290
Knox	14	40	479	68	601	8	57	6,460	19	212	39,880	459	121,685
Lincoln		4	291	11	306				2	17	3,740	281	50,175
Sagadahoc			82	7	89							78	13,175
Cumberland		26	326	32	384				12	139	21,915	312	55,985
York			185	6	191							172	33,405
Total	44	113	2,501	134	2,792	23	152	15,460	53	578	103,135	2,365	487,755
New Hampshire: Rockingham			80		80							74	12,130
Massachusetts:													
Essex			193	6	199							183	49,350
Suffolk		26	15	111	152				11	146	31,525	14	3,225
Norfolk			32		32							32	7,150
Plymouth			179	3	182							172	31,910
Barnstable			64		64							62	12,455
Nantucket			8		8							7	800
Dukes			33		33							31	9,760
Bristol			28		28							24	7,425
Total		26	552	120	698				11	146	31,525	525	122,075
Rhode Island:													
Newport and Bristol	12		207	11	230	5	32	6,290				170	58,620
Washington and Kent			81		81							62	11,680
Total	12		289	11	311	5	32	6,290				232	70,300
Connecticut:													
New London	9		178		187	3	20	5,160				195	40,249
Middlesex			34		34							45	7,420
New Haven			80		80							99	11,697
Fairfield	a 10		64		74	a 4	34	5,930				85	11,265
Total	19		356		375	7	54	11,090				424	70,631

New York:													
Suffolk	7		53		60	3	22	8,060				40	16,475
Nassau			13		13							8	3,800
Kings	30		26		[a] 56	9	79	10,585				20	3,295
Richmond	6		10		16	2	32	2,060				3	990
Westchester			9		9							7	690
Total	43		111		154	14	133	20,705				78	25,250
New Jersey: Monmouth and Hudson	10		75		85	3	44	6,290				42	14,035
Delaware: Sussex			13		13							8	1,985
Grand total	128	139	3,977	265	4,508	52	415	59,833	64	724	134,660	3,748	804,161

[a] Includes 1 vessel and crew from New Haven County.

LOBSTER FISHERY OF THE ATLANTIC COAST STATES IN 1913—Continued.

States and counties.	Lobster pots.		Lobster cars.		Shore and accessory property.	Cash capital.	Total investment.	Lobsters caught.		
	Number.	Value.	Number.	Value.				Number.	Pounds.	Value.
Maine:										
Washington	41,830	$54,821	459	$4,147	$27,900	$13,000	$192,448	792,370	1,187,475	$237,495
Hancock	43,955	59,057	490	3,747	19,250	5,000	254,404	1,429,867	2,126,575	428,415
Knox	32,460	45,129	446	10,027	60,225	170,500	453,906	1,168,753	1,755,955	351,187
Lincoln	20,779	28,362	234	1,616	37,270	18,000	139,163	523,952	755,040	152,526
Sagadahoc	3,125	4,688	70	670	400	2,500	21,433	218,332	317,500	62,650
Cumberland	15,250	22,888	271	5,355	56,075	143,000	305,218	589,977	887,415	176,361
York	10,529	16,710	139	875	2,400	1,800	55,190	433,796	640,707	117,143
Total	167,928	231,655	2,109	26,437	*a* 203,520	353,800	1,421,762	5,157,047	7,670,667	1,526,776
New Hampshire:										
Rockingham	4,665	8,875	51	170	700	....	21,875	261,081	301,710	108,560
Massachusetts:										
Essex	10,166	13,690	113	981	4,150	10,000	78,171	457,015	574,039	102,471
Suffolk	790	1,030	98	13,620	168,500	250,500	468,400	30,562	38,227	7,024
Norfolk	2,752	3,465	30	129	100	....	10,844	158,031	197,534	35,568
Plymouth	10,978	13,705	120	1,136	1,600	12,000	60,351	403,465	489,773	102,809
Barnstable	2,855	3,600	46	188	100	....	16,343	45,423	99,225	16,697
Nantucket	310	385	5	25	....	....	1,210	3,200	6,600	1,320
Dukes	2,235	2,775	29	145	200	....	12,880	76,124	95,006	15,622
Bristol	1,738	1,980	18	90	150	....	9,645	23,985	23,985	8,912
Total	31,824	40,630	459	16,314	174,800	272,500	657,844	1,197,805	1,524,389	290,423
Rhode Island:										
Newport and Bristol	17,472	21,650	140	1,995	5,600	33,000	127,155	920,180	1,128,069	173,158
Washington and Kent	5,155	6,670	48	89	2,000	....	20,439	124,128	154,987	24,802
Total	22,627	28,320	188	2,084	7,600	33,000	147,594	1,044,308	1,283,056	197,960
Connecticut:										
New London	13,507	20,687	97	300	1,000	....	67,396	363,743	445,574	72,280
Middlesex	1,264	1,716	48	155	100	....	9,391	29,474	40,237	7,863
New Haven	3,467	4,919	100	284	350	....	17,250	107,775	135,519	29,268
Fairfield	3,742	5,334	71	245	300	....	23,074	74,242	103,105	22,356
Total	21,980	32,656	316	984	1,750	....	117,111	575.234	724,435	131,767

New York:										
Suffolk	4,907	7,125					31,660	186,980	242,716	46,860
Nassau	637	787	3	26			4,613	9,670	11,600	2,570
Kings	4,930	5,180	16	78	500		19,638	113,025	137,195	24,347
Richmond	1,045	1,095	5	85	100		4,330	33,425	36,700	6,281
Westchester	122	145	10	35			880	5,500	7,600	1,775
Total	11,641	14,332	34	224	600		61,121	348,550	435,811	81,783
New Jersey: Monmouth and Hudson	7,696	8,537	88	701	1,600		31,163	227,776	301,349	54,155
Delaware: Sussex	368	368			75		2,428	20,480	25,600	4,398
Grand total	268,729	365,373	3,245	46,914	390,645	659,300	2,460,898	8,832,281	12,267,017	2,394,822

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[a] Includes the value of 29 lobster pounds amounting to $79,800. Impounded in these in 1913 were 764,572 lobsters, weighing 1,146,857 pounds from Maine waters, and 182,132, weighing 273,198 pounds, from Nova Scotia. The quantity taken out and marketed during the year included 667,326 Maine lobsters, weighing 996,953 pounds, and 160,120 Nova Scotia lobsters, weighing 240,180 pounds.

For years the lobster fishery as a whole has presented the anomaly of a yearly declining output and a yearly increasing income to the fishermen. Going back 24 years, to 1889, when the Bureau gathered complete statistics of the fishery, it appears that the catch in 1913 showed a decrease of 18,504,556 pounds, or 60 per cent, while the receipts of the fishermen increased $1,533,525, or 178 per cent. What this has meant to the consumer is readily appreciated by everyone who has had occasion to buy lobsters either regularly or occasionally. The variations in the average price per pound received by the fishermen for a series of years beginning with 1880 are shown in the following table, which explains in part why fishermen as a class have been much less solicitous regarding the welfare of the lobster than have other persons. For instance, the lobster fishermen of Maine in 1913 received eleven times as much per pound for their catch as they did in 1880 and nearly two and one-half times as much as in 1900.

AVERAGE PRICE OF LOBSTERS PER POUND FOR MAINE, MASSACHUSETTS, AND THE ENTIRE ATLANTIC COAST IN VARIOUS YEARS FROM 1880 TO 1913.

Year.	Maine.	Massachusetts.	Atlantic coast.
1880	$0.018	$0.036	$0.024
1887	.022	.044	.027
1888	.023	.046	.029
1889	.022	.044	.027
1892	.031	.064	.044
1897[a]	.066	.075	.068
1897	....	....	.083
1898	.088	.087	.087
1900	.086	.095	.088
1902	.087	.103	.089
1904	....	....	.122
1905	.109	.137	.113
1908	.127	.125	.126
1913	.198	.189	.191

[a] Fiscal year.

Such comparative statistics as are available, representing canvasses made by this Bureau through its field agents, show the tremendous loss which the State of Maine in particular has sustained through failure to place the permanent welfare of all the people of the State above the temporary gain of the fishermen. From the maximum yield obtained in the years 1887, 1888, and 1889, there was a meteoric fall to less than 30 per cent of the average for those three years, while in the last 11 years the decline was nearly 40 per cent. The decrease of the lobster in Massachusetts has been nearly as great as in Maine, but the effect on the general supply has been much less important. Of the two remaining major lobster-producing States, Connecticut appears to have been experiencing a healthy improvement during the past 10 years, although 1913, the best year in that period, produced less than 40 per cent of the yield of 20 years before, while Rhode Island has in recent years had a lobster catch that has been 40 to 50 per cent larger than in any of the earlier years.

COMPARATIVE STATISTICS OF THE LOBSTER PRODUCT OF THE ATLANTIC COAST STATES FOR VARIOUS YEARS FROM 1880 TO 1913.[a]

Years.	Maine.		New Hampshire.		Massachusetts.		Rhode Island.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1880	14,234,182	$268,739	250,000	$7,500	4,315,416	$158,229	423,250	$15,871
1887	22,916,642	512,044	142,824	6,268	3,511,075	156,204	570,039	27,128
1888	21,694,731	515,880	186,350	6,256	3,743,475	172,936	588,500	28,047
1889	25,001,351	574,165	137,175	6,415	3,353,787	148,492	456,000	21,565
1890	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
1891	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
1892	17,642,677	663,043	196,350	11,700	3,182,270	205,638	774,100	53,762
1897[c]	10,300,880	683,082	90,300	5,493	2,089,502	157,330	(b)	(b)
1897	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
1898	11,183,294	992,855	108,515	9,372	1,693,741	147,702	578,066	43,290
1900	12,346,450	1,062,206	205,122	19,078	1,805,042	171,825	660,017	58,026
1902	12,163,389	1,066,407	128,463	14,863	1,695,688	175,095	397,305	39,488
1904	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
1905	9,018,759	989,799	256,052	32,575	1,283,071	176,234	529,827	64,358
1908	9,929,000	1,269,000	264,000	43,000	2,455,000	307,000	1,425,000	132,000
1913	7,670,667	1,525,776	301,710	108,560	1,524,389	290,423	1,283,056	197,960

Years.	Connecticut.		New York.		New Jersey.		Delaware.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1880	613,385	$23,002	135,000	$5,062	156,800	$5,488	150	$6
1887	1,487,020	82,594	114,000	6,850	101,580	7,719	39,000	910
1888	1,477,226	85,723	248,000	13,900	181,688	12,965	39,000	910
1889	1,501,290	83,099	124,023	12,780	188,347	14,301	9,600	480
1890	(b)	(b)	150,400	14,754	185,321	13,683	7,200	360
1891	(b)	(b)	165,093	15,655	165,664	12,463	8,200	410
1892	1,614,530	101,358	(b)	(b)	143,905	10,861	5,600	285
1897[c]	(b)	(b)	130,610	10,913	79,230	6,197	(b)	(b)
1897	(b)	(b)	381,020	31,458	99,230	8,573	5,095	459
1898	1,098,192	83,748	332,378	30,235	123,876	11,097	(b)	(b)
1900	550,450	51,484	156,260	21,224	40,800	6,400	3,600	336
1902	371,650	40,719	(b)	(b)	(b)	(b)	(b)	(b)
1904	(b)	(b)	229,697	27,059	141,340	18,269	2,600	286
1905	436,790	56,141	(b)	(b)	(b)	(b)	(b)	(b)
1908	661,000	84,000	423,000	57,000	115,000	16,000	5,500	800
1913	724,435	131,767	435,811	81,783	301,349	54,155	25,600	4,398

[a] The statistics for 1908 in the above table are from data published by the Bureau of the Census.
[b] Statistics not available.
[c] Fiscal year.

Further evidence of the trend of the lobster fishery is afforded by a consideration of the amount of apparatus required now and formerly to produce a given catch. In all the States more pots are set now than in the earlier years, and the average yield per pot is much less. Going back only as far as 1892, it is seen that the Maine lobstermen then took an average of 115 pounds of lobsters in their 153,000 pots, while in 1913 they obtained only an average of 46 pounds of lobsters in their 167,900 pots. Similar striking comparisons are possible for other States, while, in pleasing contrast, a large increase in the number of traps used by the Rhode Island fishermen has been accompanied by an increased average yield per trap in the preceding 10 years, although one-half the average of 1892 has not been attained.

NEW ENGLAND VESSEL FISHERIES.

The great offshore vessel fisheries centering at the Massachusetts ports of Boston and Gloucester have been covered by the usual inquiries of the local agents, and the data collected have been published in monthly and annual bulletins showing by species and fishing grounds the quantities and values of the products landed. This series of bulletins affords an invaluable basis fòr determining the condition and trend of the New England high-sea fisheries.

In 1914 the fleet landing fish at these two ports numbered 393 sail, steam, and gasoline-screw vessels. The number of trips landed at Boston was 3,389. aggregating 92,344,192 pounds of fish, valued at $2,613,987, and at Gloucester 4,209 trips, aggregating 70,245,028 pounds, valued at $1,781,043; a total for both ports of 7,598 trips and 162,589,220 pounds of fish, valued at $4,395,030. Compared with 1913, there was a decrease of 1,231 trips, an increase of 372,434 pounds, and a decrease of $587,987. There was an increase in the yield of cod and haddock, with a decrease in value, and a decrease in both the quantity and value of both hake and pollock. The catch of cusk was not quite so large as in the previous year, but there was a slight increase in the value. The halibut product fell off 1,908,569 pounds in quantity and $183,454 in value. The mackerel catch increased 1,012,848 pounds in quantity and $7,657 in value. Both herring and swordfish showed a decrease. The Newfoundland herring fishery fell off 2,393,979 pounds in quantity and $4,101 in value; the frozen-herring catch was nearly double that of the year previous, but there was a large decrease in salted herring.

The following tables show in detail (1) by fishing grounds and (2) by months the yield of the vessel fisheries out of Boston and Gloucester during the calendar year 1914. The weights of fresh and salted fish given in the tables represent the fish as landed from the vessels, and the values are those received by the fishermen. The grades or sizes given for certain species are those recognized in the trade.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1914, SHOWN BY FISHING GROUNDS.

Fishing grounds.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
		Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.													
East of 66° west longitude.													
La Have Bank	20	87,705	$3,276			81,480	$1,670			3,793	$62		
Western Bank	39	134,597	3,773			133,752	2,498			9,508	126		
Quereau Bank	6	18,285	950			4,425	132			200	4		
Grand Bank	4			2,720	$122			1,100	$44				
Off Newfoundland	3												
Cape North	1	14,795	392			41,000	820			7,850	79		
Cape Shore	182	466,432	19,441			485,387	11,161			83,392	1,430		
Gulf of St. Lawrence	3	4,000	120										
St. Anns Bank	1	2,000	65			12,000	180			50	1		
West of 66° west longitude.													
Browns Bank	203	840,424	31,141			1,112,453	22,616			118,895	1,591		
Georges Bank	290	852,287	36,977			552,774	12,823			39,084	679		
Cashes Bank	24	37,036	1,346			65,460	1,360			3,214	55		
Clark Bank	3	18,225	463			23,895	406			1,255	21		
Fippenies Bank	8	10,100	382			19,140	376			565	8		
Tillies Bank	2	270	16			465	27			85	3		
Middle Bank	431	226,433	11,402			532,710	13,779			98,282	1,669		
Jeffreys Ledge	267	120,682	5,731			230,101	5,709			24,588	434		
Ipswich Bay	45	187,455	7,657			72,781	2,179			6,740	132		
South Channel	440	559,122	23,425			1,105,056	23,655			93,376	1,388		
Nantucket Shoals	224	1,107,732	45,841			1,905,150	42,073			121,055	1,578		
Off Highland Light	1	230	10			400	10						
Off Chatham	762	2,830,365	114,039			5,592,628	106,289			359,237	4,972		
Off Race Point	21												
South	2												
Shore, general	398	501,626	18,876			333,294	7,778			41,272	672		
Total	3,389	8,019,801	325,323	2,720	122	12,304,351	255,541	1,100	44	1,012,441	14,904		

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., ETC.—Continued.

Fishing grounds.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT GLOUCESTER.													
East of 66° west longitude.		*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
La Have Bank	28	114,610	$3,065	20,545	$856	168,320	$3,626	16,110	$608	18,160	$140	2,645	$79
Western Bank	78	1,146,531	26,406	212,742	9,202	1,222,975	23,171	240,000	9,061	65,730	554	23,465	705
Quereau Bank	52	606,455	13,748	665,886	26,881	830,800	15,539	786,127	29,729	20,625	155	158,520	4,816
Green Bank	4			10,465	498			1,890	83				
Grand Bank	41	49,690	1,116	1,351,651	55,081	11,415	210	573,852	20,071	125	1	42,365	1,271
St. Peters Bank	3			10,545	469			2,520	96				
Bacalieu Bank	7			47,643	2,019			12,495	458			725	22
Off Newfoundland	37			1,570,120	46,364			732,453	26,798			25,500	765
Cape North	14	349,675	7,987	278,325	11,342	344,500	6,527	409,635	15,454	4,865	36	36,130	1,090
Cape Shore	74	256,260	6,347	92,990	4,164	379,945	7,526	97,295	3,880	42,005	386	15,144	457
Gulf of St. Lawrence	41	149,780	3,407	1,171,079	46,266	28,195	541	130,860	5,361			2,365	71
St. Anns Bank	6	64,576	1,614			142,991	2,860			6,980	53		
The Gully	9	57,445	1,303	48,465	2,351	13,080	230	10,165	438				
Labrador Coast	2			741,197	33,470								
West of 66° west longitude.													
Browns Bank	77	449,634	10,615	26,321	1,185	619,675	12,056	32,845	1,346	78,020	616	8,590	248
Georges Bank	123	299,080	7,427	631,772	31,130	892,750	18,356	520,303	21,806	45,675	355	31,017	934
Cashes Bank	3	1,050	25			7,550	151			1,070	8		
Middle Bank	11												
Jeffreys Ledge	2	645	15			2,430	45			350	3		
Ipswich Bay	157												
South Channel	73	526,165	12,291			1,216,986	25,349			74,965	652		
Nantucket Shoals	174	405,700	9,518	208,205	7,501	2,260,205	44,887	376,685	14,656	159,735	1,193	46,260	1,386
Off Chatham	10												
Bay of Fundy	1												
South	1												
Shore, general	3,181	1,366,092	47,670	4,321	212	200,255	4,044	10,389	443	39,515	316	7,310	219
Total	4,209	5,843,388	152,554	7,092,272	278,991	8,342,072	165,118	3,953,624	150,288	557,820	4,468	400.036	12,063
Grand total	7,598	13,863,189	477,877	7,094,992	279,113	20,646,423	420,659	3,954,724	150,332	1,570,261	19,372	400,036	12,063

Fishing grounds.	Haddock.						Hake.					
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).		Large (6 pounds and over).				Small (under 6 pounds).	
	Fresh.		Salted.		Fresh.		Fresh.		Salted.		Fresh.	
LANDED AT BOSTON.												
East of 66° west longitude.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
La Have Bank	510,390	$10,840			29,285	$627	35,680	$1,220			31,335	$722
Western Bank	842,967	15,131			153,775	1,878	16,250	358			17,670	279
Quereau Bank	4,750	226			680	20	10,125	428			1,210	18
Cape North	42,200	1,205			150	2	3,000	60			3,900	29
Cape Shore	2,682,548	86,188			81,533	1,977	241,633	7,941			352,437	6,127
St. Anns Bank	44,000	914			75	2	3,000	73			1,850	13
West of 66° west longitude.												
Browns Bank	6,925,475	176,600			337,516	6,406	114,975	3,732			128,552	2,844
Georges Bank	3,797,215	110,871			738,873	19,160	21,120	729			72,800	1,190
Cashes Bank	25,030	704			1,075	22	97,250	3,178			218,033	3,629
Clark Bank	81,660	1,268			7,640	30						
Fippenies Bank	6,485	131			530	16	31,815	1,126			48,010	913
Tillies Bank	4,595	268			1,465	61	705	46			3,225	131
Middle Bank	2,081,734	80,103			280,001	6,715	259,610	10,165			942,195	18,705
Jeffreys Ledge	422,416	19,322			50,071	1,363	219,039	7,233			472,942	10,077
Ipswich Bay	18,560	923			100	3	1,060	54			2,205	69
South Channel	10,530,890	276,659			3,861,028	59,114	352,753	10,938			830,704	14,107
Nantucket Shoals	243,831	6,401			20,688	507	11,300	283			12,210	186
Off Highland Light	16,940	678			2,470	49	790	47			2,095	55
Off Chatham	12,496,470	292,953			649,544	8,843	404,055	11,863			1,000,241	16,828
Shore, general	256,417	8,311			19,343	416	574,763	17,197			970,659	16,167
Total	40,984,573	1,089,696			6,235,842	107,211	2,398,923	76,671			5,112,273	92,068
LANDED AT GLOUCESTER.												
East of 66° west longitude.												
La Have Bank	263,070	7,320	2,145	$44	10,525	160	766,903	9,980	16,000	$288		
Western Bank	566,910	6,393	4,175	84			1,630,635	21,692	24,495	487		
Quereau Bank	117,795	1,298	19,838	426			139,325	1,886	37,987	701		
Green Bank							7,790	110	3,240	63		
Grand Bank	565	9	14,030	281			138,260	1,837	64,820	1,249		
St. Peters Bank			40	1			13,775	193	1,380	25		

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., ETC.—Continued.

Fishing grounds.	Haddock.						Hake.					
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).		Large (6 pounds and over).				Small (under 6 pounds).	
	Fresh.		Salted.		Fresh.		Fresh.		Salted.		Fresh.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT GLOUCESTER—continued.												
East of 600 west longitude—Continued.												
Off Newfoundland	....	....	460	$9	....	....	....	....	....	....	....	....
Cape North	2,780	$31	26,345	518	....	....	55,855	$779	16,626	$318	1,070	$21
Cape Shore	246,605	4,123	11,955	201	3,370	$25	610,377	8,438	16,397	289	450	8
Gulf of St. Lawrence	....	....	....	....	....	....	14,635	190	15,775	299	....	....
St. Anns Bank	4,520	50	....	....	....	....	1,070	15	....	....	....	....
The Gully	8,635	96	....	....	....	....	11,885	142	7,935	159	....	....
West of 66° west longitude.												
Browns Bank	2,081,908	27,120	260	5	6,930	45	176,730	2,287	8,495	149	....	....
Georges Bank	2,497,786	28,474	52,297	1,058	70,442	478	60,046	799	7,873	171	....	....
Cashes Bank	2,090	23	....	....	....	....	22,510	286	....	....	3,600	40
Jeffreys Ledge	135	1	....	....	....	....	10,590	122	....	....	....	....
South Channel	1,293,585	14,417	....	....	49,580	260	13,520	177	....	....	500	10
Nantucket Shoals	211,966	2,421	23,732	455	88,730	488	2,270	30	690	14	....	....
Shore, general	2,846,822	87,908	245	5	3,442	22	1,329,236	20,396	320	6	8,710	87
Total	10,145,172	179,684	155,522	3,087	233,019	1,478	5,006,412	69,359	222,033	4,218	14,330	166
Grand total	51,129,745	1,269,380	155,522	3,087	6,468,861	108,689	7,404,335	146,030	222,033	4,218	5,126,603	92,255

Fishing grounds.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT BOSTON.												
East of 66° west longitude.												
La Have Bank	11,106	$298			71,578	$1,216			32,430	$3,481		
Western Bank	21,810	380			45,165	785			102,726	8,607		
Quereau Bank	1,075	42			140	4			28,780	3,095		
Grand Bank									123,000	12,010		
Cape North									69	14		
Cape Shore	39,385	906			422,348	7,137			42,185	5,387		
Gulf of St. Lawrence									140,000	7,000		
St. Anns Bank									48	5		
West of 66° west longitude.												
Browns Bank	76,250	1,797			861,097	13,771			158,887	22,541		
Georges Bank	59,860	1,545			65,717	1,127			51,074	6,988		
Cashes Bank	13,260	318			108,604	1,742			2,372	242		
Clark Bank	2,985	33							1,124	144		
Fippenies Bank	3,010	77			50,705	810			159	24		
Tillies Bank	320	12			230	9			20	5		
Middle Bank	317,728	8,891			383,441	7,389			15,324	2,252		
Jeffreys Ledge	1,076,692	26,287			214,657	4,121			5,806	678		
Ipswich Bay	13,225	382			3,386	68			934	39		
South Channel	347,412	7,183			127,580	1,876			58,138	7,682		
Nantucket Shoals	210,937	3,685			1,790	42			12,787	1,315		
Off Highland Light	260	8			100	3			35	6		
Off Chatham	2,309,029	35,564			61,038	1,006			45,020	6,182		
Shore, general	150,745	2,964			250,970	4,865			5,919	744		
Total	4,655,069	90,372			2,668,546	45,970			826,836	88,441		
LANDED AT GLOUCESTER.												
East of 66° west longitude.												
La Have Bank	26,570	293	8,155	$160	405,470	6,956	10,125	$303	128,847	9,887		
Western Bank	65,900	663	12,977	308	690,932	11,618	18,700	533	328,913	24,750	550	$48
Quereau Bank	11,112	110	12,658	240	49,590	944	15,355	427	312,275	23,438	2,178	218
Green Bank					150	2	112	4	80,874	6,000		
Grand Bank			9,225	183	4,610	78	2,940	83	354,001	23,314	24,923	2,166
St. Peters Bank					40	1	815	25	72,999	5,406		
Bacalieu Bank							35	1	51,915	1,943	206,508	20,647
Cape North	3,015	31	7,535	151	3,585	60	1,085	28	13,825	902	93	8

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., ETC.—Continued.

Fishing grounds.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT GLOUCESTER—continued.												
East of 66° west longitude—Continued.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cape Shore	42,880	$423	7,505	$135	792,387	$14,058	26,720	$805	193,403	$15,751	965	$97
Gulf of St. Lawrence	1,150	12	635	13	3,840	64	1,175	32	327,826	17,238	74,423	6,257
St. Anns Bank	2,235	22										
The Gully	315	6	104	2	5,100	90	3,550	89	87,185	7,846	5,615	505
West of 66° west longitude.												
Browns Bank	32,314	305	790	15	622,351	10,954	1,890	57	26,669	2,119		
Georges Bank	129,306	1,336	100,402	1,982	237,535	4,101	14,310	402	256,862	19,667	1,330	127
Cashes Bank	255	3			29,400	501						
Jeffreys Ledge					11,600	203						
South Channel	402,835	4,470			6,682	119			100	12		
Nantucket Shoals	300,880	3,234	50,200	1,005	10,225	291	15,125	443				
Shore, general	6,569,690	94,242	991	20	205,010	3,537			470	63		
Total	7,588,457	105,150	211,177	4,214	3,078,507	53,577	111,937	3,232	2,236,164	157,836	316,585	30,073
Grand total	12,243,546	195,522	211,177	4,214	5,747,053	99,547	111,937	3,232	3,063,000	246,277	316,585	30,073

Fishing grounds.	Mackerel.											
	Large (over 2½ pounds).				Medium (1½ to 2½ pounds).				Small (under 1½ pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.												
East of 66° west longitude.												
Cape Shore	174,779	$23,984	15,200	$760	170,157	$9,579			78,988	$1,002		
West of 66° west longitude.												
Georges Bank	4,655	925			13,599	948			9,030	208		
Middle Bank	18,856	3,269			79,175	6,619			196,290	11,595		
Jeffreys Ledge	320	102			1,341	241						
Ipswich Bay									7,535	919		
South Channel	5,456	1,472			9,455	1,574			43,256	885		
Nantucket Shoals	88,830	5,106			36,494	2,631			162,945	6,142		
Off Chatham	91,069	5,490			102,702	6,932			962,400	35,046	22,400	$1,008
Off Race Point	1,061	285			5,399	618			163,040	9,856		
South	11,362	1,261			366	36						
Shore, general	51,923	4,003			87,279	4,961			788,516	26,967	1,600	76
Total	448,311	45,897	15,200	760	505,967	34,139			2,412,000	92,620	24,000	1,084
LANDED AT GLOUCESTER.												
East of 66° west longitude.												
Cape Shore	24,600	1,163	405,000	19,949	400	12						
Gulf of St. Lawrence			479,800	31,435			8,800	$352			44,400	1,776
West of 66° west longitude.												
Middle Bank					2,200	110	4,900	463	23,960	575	200	12
Ipswich Bay					3,330	281			185,335	5,003		
Nantucket Shoals	7,200	536			25,200	1,637	365,200	26,699	20,200	934	587,500	26,881
Off Chatham	400	21			550	17			5,250	110	223,960	10,647
South	2,400	264										
Shore, general	88,866	4,611			136,226	5,853	291,080	26,796	88,000	2,518	258,415	11,570
Total	123,466	6,595	884,800	51,384	167,906	7,910	669,980	54,310	322,745	9,140	1,114,475	50,886
Grand total	571,777	52,492	900,000	52,144	673,873	42,049	669,980	54,310	2,734,745	101,760	1,138,475	51,970

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., ETC.—Continued.

Fishing grounds.	Miscellaneous.				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.			
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.										
East of 66° west longitude.										
La Have Bank	1,688	$61			896,470	$23,473			896,470	$23,473
Western Bank	15,349	341			1,493,569	34,156			1,493,569	34,156
Quereau Bank	1,145	81			70,815	5,000			70,815	5,000
Grand Bank					123,000	12,010	3,820	$166	126,820	12,176
Off Newfoundland	[a] 480,000	11,700	[a] 70,000	$2,100	480,000	11,700	70,000	2,100	550,000	13,800
Cape North	150	9			113,114	2,610			113,114	2,610
Cape Shore	719,993	69,677			5,991,197	251,937	15,200	760	6,006,397	252,697
Gulf of St. Lawrence					144,000	7,120			144,000	7,120
St. Anns Bank					63,023	1,253			63,023	1,253
West of 66° west longitude.										
Browns Bank	80,062	2,094			10,754,606	285,133			10,754,606	285,133
Georges Bank	1,041,745	117,236			7,319,833	311,406			7,319,833	311,406
Cashes Bank	10,480	284			581,814	12,880			581,814	12,880
Clark Bank					136,784	2,365			136,784	2,365
Fippenies Bank	3,116	87			173,635	3,950			173,635	3,950
Tillies Bank	314	17			11,694	595			11,694	595
Middle Bank	200,618	4,604			5,632,397	187,157			5,632,397	187,157
Jeffreys Ledge	67,851	2,102			2,906,505	83,400			2,906,505	83,400
Ipswich Bay	2,028	61			316,009	12,486			316,009	12,486
South Channel	912,372	24,176			18,836,598	454,134			18,836,598	454,134
Nantucket Shoals	103,951	1,278			4,039,700	117,068			4,039,700	117,068
Off Highland Light	1,630	54			24,950	920			24,950	920
Off Chatham	428,785	8,060			27,332,583	654,066	22,400	1,008	27,354,983	655,074
Off Race Point	98,110	1,473			267,610	12,232			267,610	12,232
South					11,728	1,297			11,728	1,297
Shore, general	476,812	7,608			4,509,538	121,529	1,600	76	4,511,138	121,605
Total	4,646,219	251,003	70,000	2,100	92,231,172	2,609,877	113,020	4,110	92,344,192	2,613,987
LANDED AT GLOUCESTER.										
East of 66° west longitude.										
La Have Bank					1,902,475	41,427	75,725	2,338	1,978,200	43,765
Western Bank					5,718,526	115,247	537,104	20,428	6,255,630	135,675
Quereau Bank					2,087,977	57,118	1,698,549	63,438	3,786,526	120,556

Green Bank					88,814	6,112	15,707	648	104,521	6,760
Grand Bank					558,666	26,565	2,083,806	80,385	2,642,472	106,950
St. Peters Bank					86,814	5,600	15,300	616	102,114	6,216
Bacalieu Bank					51,915	1,943	267,406	23,147	319,321	25,090
Off Newfoundland	a 2,955,383	90,242	a 5,554,764	101,705	2,955,383	90,242	7,883,297	175,641	10,838,680	265,883
Cape North					779,170	16,374	775,774	28,909	1,554,944	45,283
Cape Shore	3,344	376			2,596,026	58,636	673,971	29,977	3,269,997	88,613
Gulf of St. Lawrence			a 210,800	4,743	525,426	21,452	2,140,112	96,605	2,665,538	118,057
St. Anns Bank					222,372	4,614			222,372	4,614
The Gully					183,645	9,213	75,834	3,544	259,479	12,757
Labrador Coast							741,197	33,470	741,197	33,470
West of 66° west longitude.										
Browns Bank					4,094,231	66,117	79,191	3,005	4,173,422	69,122
Georges Bank					4,489,482	80,993	1,359,304	57,610	5,848,786	138,603
Cashes Bank					67,525	1,037			67,525	1,037
Middle Bank	6,200	93			32,360	778	5,100	475	37,460	1,253
Jeffreys Ledge					25,750	389			25,750	389
Ipswich Bay	1,091,225	11,748			1,279,890	17,032			1,279,890	17,032
South Channel	3,170	55			3,588,088	57,812			3,588,088	57,812
Nantucket Shoals					3,492,311	65,169	1,673,597	79,040	5,165,908	144,209
Off Chatham					6,200	148	223,960	10,647	230,160	10,795
Bay of Fundy	3,800	361			3,800	361			3,800	361
South					2,400	264			2,400	264
Shore, general	1,622,243	15,859	a 3,200	80	14,504,577	287,126	576,271	39,351	15,080,848	326,477
Total	5,685,365	118,734	5,768,764	106,528	49,343,823	1,031,769	20,901,205	749,274	70,245,028	1,781,043
Grand total	10,331,584	369,737	5,838,764	108,628	141,574,995	3,641,646	21,014,225	753,384	162,589,220	4,395,030

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a Herring. Other items under "Miscellaneous" include albacore, 200 pounds, value $6; bluebacks, 1,652,350 pounds, value $14,490; butterfish, 46,666 pounds, value $2,384; catfish or wolffish, 132,560 pounds, value $2,214; flounders, 862,585 pounds, value $29,401; herring, 1,474,700 pounds, value $16,643; redfish, 65,704 pounds, value $1,166; shad, 107,760 pounds, value $1,976; sharks, 12,079 pounds, value $228; skates, 45,298 pounds, value $735; sturgeon, 269 pounds, value, $29; swordfish, 1,499,844 pounds, value $177,069; squid, 16,500 pounds, value $165; livers, 831,500 pounds, value $10,547; sounds, 70,505 pounds, value $4,319; spawn, 77,081 pounds, value $5,815; and tongues, 600 pounds, value $8.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1914, SHOWN BY MONTHS.

Months.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
		Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.													
January	189	323,376	$13,819			400,109	$9,785			84,848	$1,678		
February	187	326,584	16,915			354,253	10,662			60,937	1,178		
March	264	867,055	36,039			796,871	17,996			84,914	1,473		
April	254	743,532	25,533	2,720	$122	910,126	18,092	1,100	$44	87,353	1,342		
May	241	955,519	26,411			1,362,068	23,460			102,866	1,567		
June	285	1,070,662	36,883			1,694,751	30,912			78,870	1,091		
July	371	1,220,335	44,307			1,785,402	32,791			94,728	1,079		
August	365	780,245	35,257			1,442,062	27,822			77,387	779		
September	346	542,209	29,340			1,428,130	31,005			86,108	1,009		
October	383	474,100	28,098			997,589	25,284			98,997	1,364		
November	267	284,580	16,552			459,701	12,857			58,362	1,122		
December	237	431,604	16,169			673,289	14,875			97,071	1,222		
Total	3,389	8,019,801	325,323	2,270	122	12,304,351	255,541	1,100	44	1,012,441	14,904		
LANDED AT GLOUCESTER.													
January	369	151,203	6,227	528,394	5,719	26,330	550	76,895	3,152	5,010	38		
February	230	88,365	4,368	32,875	1,724	22,935	552	8,760	398	3,155	100	240	$8
March	597	286,845	9,137	75,823	3,802	135,173	2,739	21,710	954	16,940	140	215	6
April	690	1,036,745	26,835	199,885	9,879	543,365	9,710	163,670	5,502	35,070	263	26,445	794
May	299	913,635	21,246	255,002	12,292	754,197	15,508	377,781	15,451	70,018	637	12,405	373
June	237	1,381,052	31,851	1,024,330	42,400	2,112,601	42,475	603,660	23,859	115,175	865	49,415	1,490
July	317	525,086	12,430	1,629,310	65,585	1,751,802	34,281	907,925	32,479	96,165	792	71,550	2,145
August	175	362,167	8,764	184,391	8,019	1,161,690	23,235	566,348	20,870	80,387	599	33,120	986
September	232	422,495	9,718	1,475,750	57,093	940,823	18,109	366,508	13,681	50,230	379	27,696	832
October	124	148,145	3,529	741,328	29,824	302,225	5,768	229,690	9,034	22,645	170	23,610	709
November	645	307,308	11,611	644,095	30,195	253,271	5,075	547,117	21,387	20,815	157	143,425	4,362
December	294	220,342	6,838	301,089	12,459	337,660	7,116	83,560	3,521	42,210	328	11,915	358
Total	4,209	5,843,388	152,554	7,092,272	278,991	8,342,072	165,118	3,953,624	150,288	557,820	4,468	400,036	12,063
Grand total	7,598	13,863,189	477,877	7,094,992	279,113	20,646,423	420,659	3,954,724	150,332	1,570,261	19,372	400,036	12,063
Grounds E. of 66° west longitude	655	3,522,836	93,010	6,224,373	239,085	3,900,265	76,691	3,014,502	112,081	263,283	3,027	306,859	9,276
Grounds W. of 66° west lognitude	6,943	10,340,353	384,867	870,619	40,028	16,746,158	343,968	940,222	38,251	1,306,978	16,345	93,177	2,787

Months.	Haddock.						Hake.					
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).		Large (6 pounds and over).				Small (under 6 pounds).	
	Fresh.		Salted.		Fresh.		Fresh.		Salted.		Fresh.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.												
January	2,881,870	$114,692	....	....	264,391	$8,293	115,214	$5,302	....	....	220,548	$6,177
February	3,224,847	129,664	....	....	406,337	12,912	61,770	3,638	....	....	154,596	5,446
March	6,048,204	151,464	....	....	455,247	8,996	55,492	3,003	....	....	231,813	6,980
April	3,572,678	61,780	....	....	201,508	2,550	159,365	6,382	....	....	338,183	6,204
May	2,196,782	50,975	....	....	266,706	2,886	208,869	4,416	....	....	313,218	3,833
June	2,621,550	54,733	....	....	192,863	2,115	196,015	4,142	....	....	226,912	3,229
July	3,208,496	54,713	....	....	322,135	2,259	196,351	5,297	....	....	305,718	5,015
August	3,716,410	65,065	....	....	482,834	3,792	220,327	6,759	....	....	298,450	5,196
September	4,160,838	92,389	....	....	1,005,318	9,883	383,913	11,182	....	....	648,697	10,434
October	4,321,778	115,374	....	....	1,172,341	17,587	457,202	12,927	....	....	1,180,349	17,609
November	2,438,761	107,136	....	....	722,332	19,587	228,534	8,897	....	....	837,844	14,069
December	2,592,359	91,711	....	....	743,840	16,351	115,871	4,726	....	....	355,945	7,897
Total	40,984,573	1,089,696	....	....	6,235,842	107,211	2,398,923	76,671	....	....	5,112,273	92,089
LANDED AT GLOUCESTER.												
January	215,126	9,915	4,850	$97	....	....	56,078	2,090	2,655	$54	....	....
February	170,561	7,589	450	9	6,465	64	12,840	542	810	17	....	....
March	2,222,122	49,128	1,960	40	14,582	180	13,885	573	10,387	207	....	....
April	2,163,322	44,899	2,350	47	6,292	34	80,130	937	1,705	34	3,600	40
May	494,028	7,248	8,440	169	18,010	99	405,502	5,482	3,670	73	....	....
June	693,695	7,606	37,725	755	103,460	569	525,595	6,859	33,346	649	....	....
July	1,009,255	11,202	26,365	508	8,850	49	739,225	9,663	44,800	898	1,070	21
August	1,279,413	14,280	19,052	381	67,000	437	978,585	12,499	15,750	314	500	10
September	1,104,276	12,211	28,842	646	980	5	1,106,960	14,866	39,412	741	....	....
October	428,573	4,715	9,745	182	2,305	13	804,328	10,887	35,208	629	9,160	95
November	177,415	5,162	9,448	143	1,145	6	125,615	1,706	10,425	183	....	....
December	187,386	5,729	6,295	110	3,930	22	156,669	3,255	23,865	419	....	....
Total	10,145,172	179,684	155,522	3,087	233,019	1,478	5,005,412	69,359	222,033	4,218	14,330	166
Grand total	51,129,745	1,269,380	155,522	3,087	6,468,861	108,689	7,404,335	146,030	222,033	4,218	5,126,603	92,255
Grounds E. of 66° west longitude	5,287,735	133,824	78,988	1,564	279,393	4,691	3,700,198	55,342	204,655	3,878	409,922	7,217
Grounds W. of 66° west longitude	45,842,010	1,135,556	76,534	1,523	6,189,468	103,998	3,704,137	90,688	17,378	340	4,716,681	85,038

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., ETC.—Continued.

Months.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.												
January	97,804	$2,878			210,242	$4,179			35,957	$6,613		
February	80,811	3,406			188,040	4,143			32,560	5,560		
March	128,173	3,847			417,583	7,794			162,721	18,063		
April	144,496	3,998			407,468	7,581			81,118	9,194		
May	205,688	3,100			150,865	2,547			126,417	12,033		
June	536,980	7,150			65,700	1,237			198,112	12,298		
July	988,892	11,555			26,098	503			49,265	3,565		
August	914,152	14,540			112,228	1,898			24,043	2,947		
September	605,804	16,461			180,535	3,133			34,465	4,121		
October	582,383	13,618			266,459	4,540			26,483	3,931		
November	208,293	8,631			202,722	3,445			17,416	3,781		
December	221,563	6,291			350,691	4,980			38,279	6,345		
Total	4,655,089	90,372			2,668,546	45,970			826,836	88,441		
LANDED AT GLOUCESTER.												
January	358,613	11,278			35,725	$691	2,700	$68	32,128	2,835		
February	112,477	5,042	1,350	$27	6,539	137	1,710	43	47,708	2,969		
March	62,523	2,095	809	16	81,096	1,346	5,015	105	252,840	19,086	7,720	$694
April	203,241	5,698	1,892	38	166,189	2,913	685	17	229,307	17,625	3,767	372
May	592,877	5,829	11,776	225	282,919	4,526	3,695	81	148,696	10,657	4,009	381
June	430,784	4,686	46,845	938	150,597	2,537	5,886	148	349,292	19,385	42,181	3,578
July	704,113	7,821	51,240	1,116	370,290	6,166	28,785	868	415,003	26,849	45,727	4,034
August	172,695	1,885	32,272	647	419,895	6,709	8,826	264	212,188	13,227	385	35
September	119,578	1,163	33,740	617	741,772	13,224	21,000	630	236,695	17,865	205,048	20,204
October	37,460	372	17,890	356	532,471	9,562	12,087	360	218,771	17,691	6,500	650
November	3,939,710	46,428	7,808	137	81,115	1,460	15,450	467	63,946	6,317	1,203	120
December	845,436	12,982	5,555	97	240,235	4,320	6,210	187	29,600	3,310	45	5
Total	7,588,457	105,150	211,177	4,214	3,078,507	53,577	111,937	3,232	2,236,164	157,836	316,585	30,073
Grand total	12,243,546	195,522	211,177	4,214	5,747,053	99,547	111,937	3,232	3,063,000	246,277	316,585	30,073
Grounds E. of 66° west longitude	226,553	3,186	58,794	1,192	2,494,935	43,013	80,612	2,330	2,421,301	175,574	315,255	29,946
Grounds W. of 66° west longitude	12,016,993	192,336	152,383	3,022	3,252,118	56,534	31,326	902	641,699	70,703	1,330	127

Months.	Mackerel.											
	Large (over 2¼ pounds).				Medium (1¼ to 2¼ pounds).				Small (under 1¼ pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.												
May	11,125	$1,224			170	$17						
June	238,260	26,657	15,200	$760	187,835	10,602			281,816	$5,427		
July	84,185	7,463			91,217	5,962			1,048,131	27,168	24,000	$1,084
August	83,961	5,158			175,302	11,683			917,093	46,650		
September	902	269			4,319	496			127,336	8,067		
October	1,727	442			6,077	849			37,200	5,284		
November	26,080	4,038			38,972	4,082			384	19		
December	2,071	646			2,075	448			40	5		
Total	448,311	45,897	15,200	760	505,967	34,139			2,412,000	92,620	24,000	1,084
LANDED AT GLOUCESTER.												
May	2,400	264										
June	27,700	1,292	375,400	18,617	2,050	62			35,580	1,061	4,360	208
July	7,200	536	29,600	1,832	6,400	462			283,705	7,847	1,064,400	48,791
August					70,820	3,459	548,600	$42,925				
September					10,300	1,106	111,580	10,943	3,060	184		
October	14,925	1,192	378,400	25,159	2,914	187	1,000	90	400	48	45,715	1,887
November	68,664	3,096	101,400	6,276	73,203	2,457	8,800	352				
December	2,577	215			2,219	177						
Total	123,466	6,595	884,800	51,884	167,906	7,910	669,980	54,310	322,745	9,140	1,114,475	50,886
Grand total	571,777	52,492	900,000	52,144	673,873	42,049	609,980	54,310	2,734,745	101,760	1,138,475	51,970
Grounds E. of 66° west longitude	199,379	25,147	900,000	52,144	170,557	9,591	8,800	352	78,988	1,002	44,400	1,776
Grounds W. of 66° west longitude	372,398	27,345			503,316	32,458	661,180	53,958	2,655,757	100,758	1,094,075	50,194

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., ETC.—Continued.

Months.	Miscellaneous.[a]				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.			
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.										
January	271,100	$8,547			4,900,459	$181,958			4,900,459	$181,958
February	354,958	10,686			5,245,693	204,212			5,245,693	204,212
March	191,582	7,326			9,434,655	262,971			9,434,656	262,971
April	66,929	1,583			6,802,751	144,229	3,820	$166	6,806,571	144,395
May	192,384	2,619			6,092,627	135,088			6,092,627	135,088
June	366,092	18,252	70,000	$2,100	7,956,418	214,728	85,200	2,860	8,041,618	217,588
July	717,936	69,837			10,088,799	271,514	24,000	1,084	10,112,799	272,598
August	566,338	53,124			9,810,842	280,660			9,810,842	280,660
September	685,806	41,157			9,894,470	258,946			9,894,470	258,946
October	638,576	20,142			10,261,261	267,049			10,261,261	267,049
November	322,703	8,950			5,846,684	208,166			5,846,684	208,166
December	271,815	8,780			5,896,513	180,856			5,896,513	180,356
Total	4,646,219	251,003	70,000	2,100	92,231,172	2,609,877	113,020	4,110	92,344,192	2,613,987
LANDED AT GLOUCESTER.										
January	2,535,750	77,654	1,687,600	31,497	3,415,963	111,278	2,303,094	40,587	5,719,057	151,865
February	181,175	5,740	22,200	500	652,201	27,123	68,395	2,726	720,596	29,849
March	14,758	807			3,100,703	85,232	123,639	5,824	3,224,342	91,056
April					4,467,204	108,954	400,399	16,683	4,867,603	125,637
May	144,000	1,728			3,796,263	73,223	676,708	29,045	4,472,971	102,268
June	682,000	6,433	588,000	14,173	6,618,441	125,601	2,811,097	106,805	9,429,538	232,406
July	476,025	4,191	84,800	2,120	6,394,149	122,307	3,987,502	159,876	10,381,651	282,183
August	131,814	1,739	31,400	942	4,937,094	86,793	1,440,153	75,383	6,377,247	162,176
September	1,014,800	10,008	5,800	145	5,751,969	98,838	2,312,426	105,532	8,064,395	204,370
October	245,700	2,586			2,770,022	56,806	1,501,123	68,884	4,271,145	125,689
November	2,210	135	1,272,748	21,181	5,114,417	83,610	2,761,919	84,803	7,876,336	168,413
December	257,133	7,713	2,076,216	35,970	2,325,397	52,006	2,514,750	53,126	4,840,147	105,131
Total	5,685,365	118,734	5,768,764	106,528	49,343,823	1,031,769	20,901,205	749,274	70,245,028	1,781,043
Grand total	10,331,584	369,737	5,838,764	108,628	141,574,995	3,641,646	21,014,225	753,384	162,589,220	4,395,030
Grounds E. of 66° west longitude	4,177,052	172,487	5,835,564	108,548	27,132,397	803,802	17,072,802	562,172	44,205,199	1,365,974
Grounds W. of 66° west longitude	6,154,532	197,250	3,200	80	114,442,598	2,837,844	3,941,423	191,212	118,384,021	3,029,056

[a] Includes herring from Newfoundland, 3,435,383 pounds frozen, $101,942, and 5,624,764 pounds salted, $103,805.

Nearly three-fourths of the fish landed by American fishing vessels at Boston and Gloucester, Mass., in 1914, or 72.81 per cent of the quantity and 68.92 per cent of the value, were from fishing grounds lying directly off the coast of the United States; 9.03 per cent of the quantity and 9.94 per cent of the value from fishing banks off the coast of Newfoundland; 17.70 per cent of the quantity and 20.37 per cent of the value from grounds off the Canadian Provinces; and less than 1 per cent of both quantity and value from the coast of Labrador. Newfoundland herring constituted 5.57 per cent of the quantity and 4.68 per cent of the value of the products landed by the fishing fleet at these ports during the year. The herring were taken on the treaty coast of Newfoundland, but cod and other species from that region were obtained chiefly from fishing banks on the high seas. All the fish caught by American fishing vessels off the Canadian Provinces were from offshore fishing grounds. The catch from each of these fishing regions is given in detail in the following table:

QUANTITY AND VALUE OF FISH LANDED BY AMERICAN FISHING VESSELS AT BOSTON AND GLOUCESTER, MASS., IN 1914, FROM GROUNDS OFF THE COAST OF THE UNITED STATES, NEWFOUNDLAND, AND CANADIAN PROVINCES.

Species.	United States.		Newfoundland.[a]		Canadian Provinces.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cod:								
Fresh....	28,393,489	$745,180	61,280	$1,327	7,625,154	$171,401	36,079,873	$917,908
Salted....	1,904,018	81,066	5,127,241	187,631	4,418,493	172,811	11,449,752	441,508
Haddock:								
Fresh....	52,031,478	1,239,554	565	9	5,566,563	138,506	57,598,606	1,378,069
Salted....	76,534	1,523	14,530	291	64,458	1,273	155,522	3,087
Hake:								
Fresh....	8,420,818	175,726	159,825	2,140	3,950,295	60,419	12,530,938	238,285
Salted....	17,378	340	69,440	1,337	135,215	2,541	222,033	4,218
Pollock:								
Fresh....	12,016,993	192,336	....	....	226,553	3,186	12,243,546	195,522
Salted....	152,383	3,022	9,225	183	49,569	1,009	211,177	4,214
Cusk:								
Fresh....	3,252,118	56,534	4,800	81	2,490,135	42,932	5,747,053	99,547
Salted....	31,325	902	3,902	113	76,710	2,217	111,937	3,232
Halibut:								
Fresh....	641,699	70,703	682,789	48,673	1,738,512	126,901	3,063,000	246,277
Salted....	1,330	127	231,431	22,818	83,824	7,133	316,585	30,078
Mackerel:								
Fresh....	3,531,471	160,561	....	....	448,924	35,740	3,980,395	196,301
Salted....	1,755,255	104,152	....	....	953,200	54,272	2,708,455	158,424
Herring:								
Fresh....	1,474,700	16,643	3,435,383	101,942	....	....	4,910,083	118,585
Salted....	3,200	80	5,624,764	103,805	210,800	4,743	5,838,764	108,628
Swordfish:								
Fresh....	868,264	109,300	....	....	631,580	68,369	1,499,844	177,669
Miscellaneous								
Fresh....	3,811,568	71,307	....	....	110,089	2,176	3,921,657	73,483
Total....	118,384,021	3,029,056	15,425,125	470,345	28,780,074	895,629	162,589,220	4,395,030

[a] Includes 741,197 pounds of salted cod, valued at $33,470, from the Labrador coast.

THE GROUND-FISH FISHERIES.

Cod.—In 1914 there were landed at Boston and Gloucester 47,529,625 pounds of cod, of which 36,079,873 pounds were fresh and 11,449,752 pounds salted, valued at $1,329,416; an increase of 6,902,642 pounds of fresh over the amount landed in 1913, but a decrease of 4,237,830 pounds in the quantity of the salted product, and a decrease of $245,459 in the total value.

Vessels using hand lines baited with cockles, fishing on Nantucket Shoals and South Channel, in 1914 had the best year for cod, it is reported in the history of the fishery. In May and June, 1915, the drift hand-line fisherman landed good fares from the same grounds, but as in 1914 there was a scarcity of fish on Georges Bank, and only a few fish were taken there by vessels fitted with trawl lines and hand lines.

Haddock.—The haddock fishery in 1914 was carried on with success, the product being 57,754,128 pounds, valued at $1,381,156, against 53,672,665 pounds, valued at $1,488,356, in 1913, an increase of over 4,000,000 pounds, but a decrease of $107,200. The principal banks resorted to were Browns, Georges, South Channel, and the grounds off Chatham, although considerable fishing was done on Middle Bank and other shore grounds. The amount of haddock caught on Georges Bank and in South Channel was over 8,000,000 pounds less than in 1913, but the catch on Browns was nearly 3,200,000 pounds greater, and there was an increase of 10,800,000 pounds from the shore grounds off Chatham. Vessels visiting the Chatham grounds in summer fish night and day, weather permitting, and the pleasant weather prevailing the greater part of this period in 1914 no doubt accounted for the remarkable increase in the catch.

Pollock.—The pollock fishery, owing to the introduction of purse seines, has in recent years been conducted on a much larger scale than formerly. Although a considerable quantity of pollock is caught by trawlers and hand-line fishermen on the offshore banks, a large portion of the fresh product landed is caught in purse seines operated from small steamers and gasoline boats on the inshore grounds. In 1914 the quantity of pollock landed at Boston and Gloucester was 12,454,723 pounds, valued at $199,736. Compared with 1913 the catch fell short 2,812,678 pounds in quantity and $61,821 in value. The pollock-seining fleet in May and June, 1915, brought in many large fares. These vessels catch also other fish in their season, among which are alewives or bluebacks, which are used chiefly for bait in the line-trawl market fishery. In 1914 the blueback catch amounted to 1,652,350 pounds, 8,250 pounds less than in 1913 and over 600,000 pounds less than in 1912.

Halibut.—There was a decrease in the catch of halibut on the Atlantic coast in 1914 of nearly 2,000,000 pounds as compared with the previous year. In the spring of 1915 several large fares of halibut were taken on various banks, which led to an increase in the fleet, and in April there were 33 vessels engaged in this fishery. The fletched halibut-fleet fishing in northern regions, namely, Greenland and Davis Strait, has greatly decreased in the last few years, only two vessels having sailed for those grounds last season.

During a part of the year the Coast Guard steamer *Androscoggin*, recently converted into a hospital ship, has rendered excellent service in caring for the sick fishermen on the fishing banks. Medical aid has been given to Canadian as well as to American fishermen.

THE OTTER-TRAWL FISHERY.

The investigation of the otter-trawl fishery, which had been in progress since June, 1912, was brought to a close by the submittal of a final report thereon in January, 1915. This report, the work of a special committee of Bureau officials, was forwarded to Congress on January 22, referred to the House Committee on the Merchant Marine and Fisheries on January 25, and ordered to be printed (H. Doc. no. 1519, 63d Cong., 3d sess.). The committee examined a very large amount of material for American and European fisheries, and reached unanimous conclusions which were accepted as the official views of the Bureau. The findings of the committee with reference to the major questions to which the fishery has given rise in American waters are as follows:

1. There is no evidence that the banks resorted to by American otter trawlers are being depleted of their fishes.

2. Otter trawling does not destroy the spawn of the important commercial fishes, all of which have floating eggs.

3. Otter trawling does not injuriously affect the bottom and does not denude it of organisms which directly or indirectly serve as food for the commercial fishes.

4. From the very nature of the two fisheries, otter trawling and line fishing can not be extensively prosecuted on the same grounds without accidental damage to lines and interference with line fishing, but in the period covered by the investigation only slight interference or damage occurred.

5. Otter trawls as compared with lines take a much larger percentage of commercial fishes too small to market, and such fishes are practically all destroyed.

6. Otter-trawl vessels as compared with trawl-line vessels market a much larger proportion of small fish.

The findings of the committee as to the effects of otter trawling are necessarily inconclusive because of the short time that has elapsed since the establishment of the fishery and because of the small number of vessels engaged. The vital consideration being the safeguarding of the food-fish supply of coming generations rather than the immediate and demonstrable effects on that supply of particular kinds of apparatus or methods, the committee believe that the otter-trawl fishery should be kept under careful observation and should be so regulated as to obviate in American waters the conditions that have arisen in the North Sea from an excessive use of otter trawls.

The measure which is regarded as the most just, reasonable, and feasible to prevent an undue development of the New England otter-trawl fishery is to restrict it to the regions to which it has up to this time practically been confined and on which its effects will be most immediately and most unmistakably manifested, namely, George Bank, South Channel, and part of Nantucket Shoals. This course will retain to the otter trawlers sufficiently extensive grounds, it will not exclude line fishermen therefrom, and will reserve to the latter's exclusive use the grounds from which they take over two-thirds of their trips.

This fishery was conducted on the same grounds as in 1913, namely, Georges, South Channel, and Western Bank, and nine vessels were regularly engaged. The fishery was carried on chiefly from Boston as heretofore, although during a portion of the year two vessels belonging to New York operated out of that port, and several vessels have begun to discharge their fares regularly at Portland.

The amount of fish landed at Boston by otter trawlers in 1914 was 16,921,295 pounds, an increase of 1,747,985 pounds over the previous year. The total number of trips brought in was 376, an increase of 50, of which there were landed from Georges 64 trips, from South Channel 272, and from Western Bank 40. This fleet also marketed at Portland 5,830,603 pounds of fish, a large portion of which was taken on Western Bank during the spring months.

The principal species taken by otter trawlers is haddock, although cod, cusk, and hake are sometimes caught in considerable quantities, especially cod. In 1914 the amount of haddock landed at Boston by otter trawlers was 14,832,950 pounds, exceeding that of the preceding year by 2,254,518 pounds. Of the total catch of this species in 1913 the quantity of scrod amounted to 2,144,062 pounds, and in 1914 to 4,176,950 pounds.

On June 16, 1915, the otter trawler *Long Island* landed at Portland 280,000 pounds of fish, and on July 1 the same vessel brought in a fare of 300,000 pounds. These are the largest fares ever taken by an American otter trawler.

THE MACKEREL FISHERY.

The catch of fresh and salted mackerel in 1914 exceeded that of the previous year by 27,139 barrels, made up of 19,427 barrels fresh and 7,712 salted. The yield on the Cape Shore and in the Gulf of St. Lawrence was 4,961 barrels, an increase of 3,017 barrels over 1913. The southern mackerel fishery in the spring of 1915 showed an improvement over 1914, the highest stock made by a single vessel up to the end of May was $8,885, which is said to be the largest made in the southern fishery since 1907. The southern fleet consisted of 42 vessels, 25 seiners and 17 netters, sailing from Boston, Gloucester, and Rockport, Mass. The first trip of mackerel was captured about 100 miles east by south from Cape Henlopen and landed at Lewes, Del., on April 9, and the first mackerel landed at Boston and Gloucester from the Cape Shore was on June 7, immediately followed by the arrival of 10 other vessels from that region. They reported many schools of fish off the coast of Nova Scotia, between Liverpool and Halifax. By the end of the month several of the Cape Shore fleet had landed two trips from that ground, and one vessel reported to be on her third trip. It is seldom that a second trip of mackerel is secured on the Cape Shore in the early part of the season. At this time there was also a considerable body of mackerel off Block Island and in the vicinity of Nantucket Shoals, frequent fares being landed at Newport and Boston from those grounds. As was the case in the early part of the mackerel season of 1914, a large quantity of small fish was taken along the coast from Cape Cod to the Gulf of Maine.

THE SWORDFISH FISHERY.

Swordfish were less plentiful in 1914 than for several years. The quantity landed at Boston and Gloucester by American fishing vessels was 1,499,844 pounds fresh, valued at $177,669, being 881,076 pounds and $18,208 less than in 1913. In the last few years a considerable fleet of Canadian vessels has been engaged in catching swordfish out of Nova Scotia ports, and much of this catch is shipped to the United States. The foreign receipts of swordfish at Boston in 1914 amounted to 4,555 fish, or 144 fish less than were received in 1913.

The first swordfish landed at Boston in 1915 was on June 21 by two vessels, one having 26 and the other 33 fish, for which the fishermen received 15 and 20 cents a pound. From June 23 to the end of the month 344 fish were brought in, the catch of seven vessels. The first swordfish landed last season was on June 15.

THE NEW ENGLAND WINTER GILL-NET FISHERY.

Thirty-eight vessels were employed in the winter gill-net fishery at Gloucester, and there was also a small fleet that fished out of Portland, Me. In the early part of the season the catch was mainly cod and pollock, chiefly the latter species, and few haddock were taken until the latter part of March. Owing to the general scarcity of fish on the inshore grounds only a few vessels were successful, and early in May many vessels of the fleet had transferred to the mackerel fishery.

NEWFOUNDLAND SEAL AND HERRING FISHERIES.

During March and April the schooner *John R. Bradley* of Gloucester was engaged in taking seals off the coast of Newfoundland, which is believed to be the first American vessel to take part in this fishery. Her catch amounted to only 235 skins. The Newfoundland fleet, consisting of about 20 steamers and a few sailing vessels, also met with poor success.

The Newfoundland herring landed at Boston, Gloucester, and other New England ports during the season of 1914–15 amounted to approximately 2,570,352 pounds fresh frozen, and 49,166 barrels, or 11,071,584 pounds, salted. The fleet bringing in these fish included about 27 American and 15 Canadian vessels.

FRESH-WATER MUSSEL FISHERY.

In the course of the general canvass of the fresh-water mussel fishery which has been in progress for several years, the streams covered in 1914 were those tributary to the Great Lakes and the Ohio and Mississippi Rivers north of the Ohio and east of the Mississippi, except tributaries of the Ohio River in Ohio, which were included in the work of the previous year. The data collected were for the calendar year 1913, and the details of the industry are shown by streams in the accompanying table. The number of persons engaged in taking mussels in the streams under consideration and in preparing them for market was 3,592, and the investment in boats, fishing apparatus, and shore and accessory property amounted to $166,855. The output included 23,317 tons of shells, valued at $382,210, and pearls worth $164,261 found in the mussels, a total of $546,471. The shells are used in the manufacture of pearl buttons. The principal fishing apparatus employed in this fishery is the crowfoot bar. The most important stream in the region canvassed is Rock River, the output of which in shells and pearls was worth $150,696. The Illinois River ranks next in importance, with a yield of shells and pearls valued at $128,692. These two rivers furnished over 51 per cent of the total product.

FRESH-WATER MUSSEL FISHERY OF STREAMS TRIBUTARY TO THE GREAT LAKES AND THE OHIO AND MISSISSIPPI RIVERS NORTH OF THE OHIO AND EAST OF THE MISSISSIPPI RIVER IN 1913.[a]

NOTE.—In the case of men working on more than one stream the catch is credited where taken, but the men, boats, and apparatus are shown under the more important stream.

Items.	Eel River, Ind.		Embarras River, Ill.		Fox River, Wis. and Ill.		Grand River, Mich.		Huron and Raisin Rivers, Mich.		Illinois River, Ill.		Iroquois River, Ill.		Kalamazoo River and minor tributary, Mich.		Kankakee River, Ind., and Ill.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Persons engaged:																		
Fishermen	24		12		122		42		15		861		12		48		57	
Shoresmen					14		3		1		103				1			
Total	24		12		136		45		16		964		12		49		57	
Fishermen, classified by method used:																		
Crowfoot bars					34		39		6		721				39		41	
Forks	8				2		31				5				8		35	
Tongs	2																5	
Rakes															10			
Diggers or dip nets											140							
Waders	24		12		108				9		36		12		30		46	
Total, exclusive of duplication	24		12		122		42		15		861		12		48		57	
Boats:																		
Rowboats	24	$200	12	$70	84	$665	43	$300	20	$150	286	$2,235	12	$75	47	$380	54	$445
Gasoline boats					6	575	5	450			504	41,210			6	410	4	350
House boats											77	10,735			2	200	1	200
Total	24	200	12	70	90	1,240	48	750	20	150	867	54,180	12	75	55	990	59	995
Apparatus:																		
Crowfoot bars ... pairs					34	355	39	395			721	7,080			39	410	41	445
Forks	8	9			2	2	31	36	6	8	5	6			8	10	17	20
Tongs	2	10															5	25
Rakes															10	15		
Diggers or dip nets											102	658						
Total		19				357		431		8		7,744				435		490
Shore and accessory property		50		45		270		220		30		4,585		50		140		245
Total investment		269		115		1,867		1,401		188		66,509		125		1,565		1,730

PRODUCTS.																		
Shells:																		
With crowfoot bars........tons..	......	......	......	......	260	5,370	324	5,572	......	......	4,046	58,252	......	......	157	4,841	78	1,860
With forks........do....	15	220	......	......	4	104	56	985	23	401	15	225	......	......	15	465	76	1,885
With tongs........do....	6	111	......	......	......	......	......	......	......	......	......	......	......	......	......	......	6	145
With rakes........do....	......	......	......	......	......	......	......	......	......	......	......	......	......	......	30	836	......	......
With diggers or dip nets......do....	......	......	......	......	......	......	......	......	......	......	1,733	28,200	......	......	......	......	......	......
With hands........do....	70	1,010	78	1,377	89	2,323	......	......	33	660	96	1,400	100	1,850	22	682	42	1,030
Total........	91	1,341	78	1,377	353	7,797	380	6,557	56	1,061	5,890	88,077	100	1,850	224	6,824	202	4,920
Pearls........	......	460	......	345	......	8,045	......	2,250	......	445	......	40,615	......	1,560	......	2,665	......	2,290
Total value of products........	......	1,801	......	1,722	......	15,842	......	8,807	......	1,506	......	128,692	......	3,410	......	9,489	......	7,210

[a] This does not include tributaries of the Ohio River in Ohio, data for which were shown in Statistical Bulletin No. 305.
[b] Includes the La Crosse, Black, Wisconsin, Lemonweir, and Baraboo Rivers.
[c] Includes 4 women.
[d] Includes 6 men and 249 women.

Fresh-water Mussel Fishery of Streams Tributary to the Great Lakes and the Ohio and Mississippi Rivers North of the Ohio and East of the Mississippi River in 1913—Continued.

Items.	Little Wabash and minor tributary, Ill.		Maple River, Mich.		Maumee River and tributaries, Ohio and Ind.		Mississinewa River, Ind.		Muskegon River, Mich.		Okaw or Kaskaskia River, Ill.		Pecatonica River, Wis. and Ill.		Rock River and minor tributaries, Wis. and Ill.		St. Croix River and minor tributaries, Minn. and Wis.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Persons engaged:																		
Fishermen	29		9		13		27		11		83		49		500		185	
Shoresmen													3		94		17	
Total	29		9		13		27		11		83		52		594		202	
Fishermen, classified by methods used:																		
Crowfoot bars			6						11				49		442		120	
Forks	25		6		11		15		7		58				33			
Tongs											4						2	
Rakes															38		40	
Dredges																	63	
Waders	4		6		2		27				83				63		28	
Total, exclusive of duplication	29		9		13		27		11		83		49		500		185	
Boats:																		
Rowboats	27	$135	9	$75	8	$40	21	$135	11	$90	74	$370	22	$150	242	$1,626	153	$1,175
Gasoline boats									2	185			25	2,300	229	16,190	34	2,860
House boats															3	400		
Total	27	135	9	75	8	40	21	135	13	275	74	370	47	2,450	474	18,216	187	4,035
Apparatus:																		
Crowfoot bars ... pairs			6	60					11	100			49	524	433	4,594	120	1,200
Forks	25	30	6	10	11	21	15	30	7	10	58	81			31	41		
Tongs											4	25					2	13
Rakes															38	50	32	45
Dredges																	36	63
Total		30		70		21		30		110		106		524		4,685		1,321
Shore and accessory property		105		25		80		80		110		505		660		5,580		1,185
Total investment		270		170		141		245		495		981		3,634		28,481		6,541

PRODUCTS.																		
Shells:																		
With crowfoot bars....tons			50	750					40	790			617	10,678	7,197	115,032	419	7,956
With forks....do	205	2,445	15	225	101	2,263	90	1,890	15	270	744	11,515			153	2,525		
With tongs....do											20	240					13	260
With rakes....do															48	792	69	1,023
With dredges....do																	225	4,500
With hands....do	4	34	9	135			51	1,005			463	6,290			22	418	9	133
Total	209	2,479	74	1,110	101	2,263	141	2,895	55	1,060	1,227	18,045	617	10,678	7,420	118,767	735	13,872
Pearls		1,040		850		210		1,025		500		5,925		785		31,929		23,160
Total value of products		3,519		1,960		2,473		3,920		1,560		23,970		11,463		150,696		37,032

FRESH-WATER MUSSEL FISHERY OF STREAMS TRIBUTARY TO THE GREAT LAKES AND THE OHIO AND MISSISSIPPI RIVERS NORTH OF THE OHIO AND EAST OF THE MISSISSIPPI RIVER IN 1913—Continued.

Items.	St. Joseph River and minor tributary, Ind. and Mich.		Sangamon River, Ill.		Wabash River and minor tributary, Ind. and Ill.		White River, Ind.		White River, East Fork, Ind.		White River, West Fork, Ind.		Miscellaneous rivers, Wis.[b]		Total.	
Persons engaged:	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Fishermen	41		41		677		35		405		17		22		[c] 3,337	
Shoresmen	1				6		1		11						[d] 255	
Total	42		41		683		36		416		17		22		3,592	
Fishermen, classified by methods used:																
Crowfoot bars	26				564		7		109				13		2,216	
Forks	1		4		454		23		374		9		7		1,116	
Tongs					207		24		269						513	
Rakes					3								2		93	
Diggers or dip nets															140	
Dredges															63	
Miscellaneous apparatus	12				1										13	
Waders	3		41		41		32		313		17		7		944	
Total, exclusive of duplication	41		41		677		35		405		17		22		3,337	
Boats:																
Rowboats	37	$255	19	$120	537	$3,997	33	$265	386	$3,499	17	$125	21	$135	2,199	$16,712
Gasoline boats	5	570			177	18,760	2	200	31	3,185			1	75	1,031	87,320
House boats	1	100			29	2,750			2	225					115	14,610
Total	43	925	19	120	743	25,507	35	465	419	6,909	17	125	22	210	3,345	118,642
Apparatus:																
Crowfoot bars ... pairs	26	282			564	7,484	7	70	109	1,266			13	130	2,212	24,395
Forks	1	1	4	5	455	617	23	30	374	449	9	16	7	9	1,103	1,441
Tongs					207	1,199	24	125	269	1,399					513	2,796
Rakes					3	5							2	4	85	119
Diggers or dip nets															102	656
Dredges															36	63
Miscellaneous apparatus		2				7										9
Total		285		5		9,312		225		3,114		16		143		29,481
Shore and accessory property		285		60		2,602		95		1,600		40		85		18,732
Total investment		1,495		185		37,421		785		11,623		181		438		166,856

PRODUCTS.																
Shells:																
With crowfoot bars....tons..	230	4,226	......	......	1,459	23,801	31	503	260	5,171	......	......	60	675	15,208	245,477
With forks....do....	1	12	14	231	753	12,530	31	501	962	16,355	22	550	12	160	3,292	55,757
With tongs....do....	......	......	......	......	359	6,073	29	464	357	6,266	......	......	......	......	790	13,559
With rakes....do....	......	......	......	......	7	120	......	......	......	......	......	......	7	85	161	2,856
With diggers or dip nets....do....	......	......	......	......	......	......	......	......	......	......	......	......	......	......	1,783	28,200
With dredges....do....	......	......	......	......	......	......	......	......	......	......	......	......	......	......	225	4,500
With miscellaneous apparatus....do....	31	393	......	......	3	60	......	......	......	......	......	......	......	......	34	453
With hands....do....	5	50	130	2,096	72	1,216	29	466	475	8,745	19	408	6	80	1,824	31,408
Total....	267	4,681	144	2,327	2,653	43,800	120	1,934	2,054	36,537	41	958	85	1,000	23,317	382,210
Pearls....	......	1,900	......	4,030	......	24,191	......	233	......	8,543	......	240	......	1,025	......	164,261
Total value of products....	......	6,581	......	6,357	......	67,991	......	2,167	......	45,080	......	1,198	......	2,025	......	546,471

FISHERIES OF CHESAPEAKE BAY AND TRIBUTARIES.

The condition of the shad and alewife fisheries of Chesapeake Bay and its tributary streams has become more precarious, and the season of 1915 was the poorest of which there is any record. There is no evidence that the States vitally interested in the perpetuation of these valuable fisheries have taken any means to alleviate the flagrant overfishing to which the salt, brackish, and fresh waters have been subjected, and the only practical measure of protection which has been afforded the schools of spawning shad and alewives has come through the action of the War Department in requiring the stationary fishing apparatus to be set so that open channels in the bay and rivers may be left for navigation.

In April, 1915, as soon as the expected failure became evident, the Bureau instituted a very comprehensive canvass of the shad and alewife fisheries of the Chesapeake basin. In addition to furnishing detailed statistics, this canvass will show the location of fixed and floating apparatus and will enable the Bureau to make an authentic and forceful presentation of the situation.

STURGEON FISHERY IN FLORIDA.

After completing the field work of the survey of oyster beds in Apalachicola Bay, Fla., an assistant of the Bureau made inquiries in regard to the sturgeon fishery of the Apalachicola River. Principally because of inadequate transportation facilities the sturgeon fishery was not pursued actively prior to 1895. For a number of years the industry grew rapidly until the effects of depletion became manifest, and in quite recent years the decline of the fishery has been very marked. The period of fishery embraces about two and one-half months, from the middle of April to the end of June. The locality of the fishery is principally in the immediate vicinity of Apalachicola at the mouth of the river and extending upstream a distance of 30 miles. The sturgeon are known to ascend the river for a distance of 200 miles or more.

The sturgeon are usually captured by means of drift nets of 6-inch mesh. The body of the fish is cut into sections and packed in ice for shipment to northern markets. The preservation and sale of the caviar forms an important phase of the fishery. The catch varies from year to year; and, while no accurate statistics were taken, it was estimated that 20,000 to 60,000 pounds are marketed each season with a value of from $2,000 to $6,000. A single specimen has yielded a return of $90 from caviar alone. The average size of fish taken is becoming much smaller, while the value of the catch as a whole is declining.

The preservation of this important fish, now so nearly exterminated, should command the thoughtful attention of the State authorities.

ALASKA FISHERIES SERVICE.

A full report on the fishing industry of Alaska during the calendar year 1914 and on the activities of the Bureau in connection therewith has been published as an appendix of the annual report of the Commissioner for 1914. A special report on Alaska fishery investigations in 1914 was prepared by the Deputy Commissioner and issued in January, 1915. In view of the fact that the fishing season of 1915 has not yet ended, no report thereon is possible, and reference will be made to some of the more important developments of the last calendar year.

During the season of 1914 the Alaska fishing industry attained its highest value. The employment of 21,200 persons and the investment of $37,000,000 therein resulted in a yield of products valued at $21,243,000, an increase of $5,500,000 over the previous year. This great advance was due largely to the abundance of red salmon and the relatively high prices commanded by canned salmon.

In the patrol work along the Alaskan coast, the agents of the Bureau have found that the fishing interests in general are in sympathy with the protective laws and observe them fully. There have been, however, a number of more or less serious violations, usually by irresponsible employees. The fishery agents have successfully prosecuted a number of cases in the local courts, and have had the helpful cooperation of the United States attorneys and marshals.

The private salmon hatcheries in Alaska have been inspected, and during the season of 1914 all were found to be well conducted, although at some plants better facilities of feeding and rearing are desirable. During the fiscal year 1914 the five private hatcheries liberated over 64,000,000 red salmon fry, and were credited with rebates of taxes aggregating $25,741, the allowance being at the rate of 40 cents per thousand for red or king salmon fry planted.

Under date of April 27, 1915, the Bureau issued an announcement that a hearing would be had at Seattle on October 1 to determine the advisability of setting aside as preserves for spawning grounds and limiting or prohibiting commercial fishing therein certain waters in Alaska as follows: Barnes Lake, near Lake Bay, including all its tributary waters and its outlet; Hetta River and Lagoon, including all tributary waters; and Sockeye Creek, the outlet of Boca de Quadra hatchery waters, together with its tributaries; and an area or zone within 500 yards of the mouth of each of the above streams.

Under the authority conferred by the Presidential proclamation setting apart Afognak Island and adjacent islands as a fish-culture reserve, 73 licenses were issued to native inhabitants in 1914 to conduct fishing operations for salmon with seines and gill nets in the waters of the reservation. Their catch was 330,930 salmon, chiefly sockeyes and humpbacks, and were mostly disposed of at Kodiak.

A limited number of permits was granted during the year authorizing the carrying on of certain fisheries operations in the Aleutian Islands Reservation. It is the plan of the Department to make the fisheries within this reservation subservient to the welfare of the native inhabitants and to allow no fishing that would be disadvantageous to them or to the perpetuation of the fisheries. It having been found that fish for use as fox food on the Pribilof Islands could be secured to advantage from the reservation, arrangements were made early in 1915 whereby the natives would be given the opportunity of furnishing the required supply.

In the winter of 1914–15 the Bureau held protracted conferences with the representatives of fishing interests in Alaska regarding the amendment of the existing laws governing fishing in that territory. A comprehensive revision of the laws to meet new conditions was considered, and a bill was drafted and tentatively agreed on. It is hoped that this or a similar measure may be taken up at the next session of Congress.

FUR-SEAL SERVICE.

At the end of the last fiscal year reports of demoralization among Government employees and natives on the Pribilof Islands reached the Department, and immediately on their receipt the Deputy Commissioner, who was at the time on the Pacific coast, was dispatched in the *Albatross*. Following his investigation of the reports, which were for the most part sustained, the agent and caretaker and the storekeeper on St. Paul Island were removed, a general reorganization of the force was effected, and the natives were placed under much-needed restraint, especially in the matter of making and using intoxicating liquors. It is a pleasure to note a decided improvement in the moral and physical condition of the natives.

In March, 1915, the Department adopted regulations governing the delivery and use of intoxicating liquors on the seal islands, and embodied these regulations in a Departmental circular.

The special investigators who were sent to the islands in the summer of 1914 conducted their work in a very thorough manner, covering the seal and other animal life, the affairs of the natives, and the relations of the Government thereto. On their return in the fall they began the preparation of their report, which was completed and submitted on January 23, 1915. On February 17 the report was transmitted to Congress with a request for publication, and it was subsequently issued as a Senate document and also as a part of the Bulletin of the Bureau of Fisheries for 1914.

The census of the seal herd, taken by the special investigators with the assistance of the local Government representatives, showed the number of animals at the close of the breeding season to be approximately 294,687, as follows. These figures indicate an increase of 26,382 animals over 1913, although the number of pups born was only about a thousand more than in the previous year.

Classes.	Number.	Classes.	Number.
Breeding cows	93,250	Yearling bachelors	23,068
Breeding bulls	1,559	Yearling cows	23,067
Idle bulls	172	Pups	93,250
Young bulls (chiefly 5-year olds)	1,658	Total	294,687
Bachelors of 2, 3, and 4 years	41,241		
Cows 2 years old	17,422		

On the recommendation of the special investigators on the ground, the number of young bachelor seals that might be killed for the uses of the natives during the calendar year 1914 was fixed at 4,500, subject to increase if the circumstances demanded it. This quota, however, was apparently not needed, and only 2,735 seals were taken during the year. The annual shipment of pelts from the islands was made in October, consisting of 2,884 sealskins, 256 blue fox skins, and 25 white fox skins. These were taken to Seattle on the Coast Guard cutter *Manning* and thence forwarded to St. Louis. Owing to the depressed condition of the fur trade, the sale of the sealskins was deferred, under special authority given by Congress.

In 1915 arrangements were made for a complete census of the seal herd, to be taken by the Bureau's agents already on the seal islands, and figures submitted indicate an increase of about 60,000 animals over the estimate for 1914. The quota of bachelor seals that could be killed to meet the requirements of the natives was fixed at 5,500.

It is apparent from the report of the special investigators of 1914 and from the results of the census of 1915 that there exists a great surplus of male seals and that commercial killing on a limited scale could properly be resumed. A noteworthy economic contingency will arise when the taking of large numbers of seals begins. The comparatively limited needs of the natives will consume but a small part of the seal meat and other products, and steps have already been taken looking to the profitable utilization of what has heretofore been wasted.

The past year has witnessed an important change in the relations of the Government to the natives in the matter of compensation for services rendered. The old practice has been to pay cash for services, and a comparatively large part of the appropriation has thus been consumed. The natives used the cash thus obtained in purchasing supplies at the Government stores, and the sums thus received were turned into the United States Treasury. There was consequently a double drain on the appropriation which, in recent years at least, was none too large for the legitimate administration of the islands and the support of the natives. Under the new system, able-bodied natives are required to perform some kind of labor, and payment is made in supplies. This arrangement at first was resented by the natives, but in general is now working well. The agent on St. George Island reports that the natives "have both privately and as a body expressed their preference for the present method of issuing all necessary supplies as against receiving pay in cash for all labor and buying with their earnings their food and all other necessary articles." It is realized that on the resumption of commercial killing when, under the law, the natives will be entitled to cash compensation for services performed in various capacities, other arrangements will have to be made. It is believed that the expense which may be connected with the commercial operations should be deducted from the selling price of the sealskins and not from the appropriation for the maintenance of the fur-seal service.

Owing to a change in the personnel on the islands, the savings of the seal-island natives, heretofore kept in a San Francisco bank in the name of a trustee, have been transferred to Washington and deposited in a local bank, and the United States Commissioner of Fisheries has been designated as trustee. The amounts thus transferred and held to the credit of the natives are $5,143.12.

An entirely new method of procedure in obtaining supplies for the Pribilof Islands was adopted for the 1915 season. In the past the general supplies have been bought either without competition or on more or less formal proposals. This year formal schedules were prepared and printed copies were distributed to prospective bidders at Seattle, San Francisco, St. Louis, Chicago, New York, Boston, and other points. While the form of proposal used permitted bidders to designate the point where they proposed to deliver the material bid upon, the majority of proposals designated Seattle as the point of delivery. Of the proposals accepted all but two were for delivery in Seattle. The business of making contracts in connection with the accepted proposals and the ordering and assembling of supplies were in progress at the end of the fiscal year.

A shortage of certain supplies on the Pribilof Islands made it necessary to arrange for a small consignment during the winter season of 1914–15. Space was accordingly secured on the schooner *Bender Bros.*, which left Seattle on February 27, 1915, for Alaskan points. The vessel arrived at St. Paul Island April 1 and at St. George Island the next day. The sending of a ship annually to the Pribilofs during the winter season should be done if practicable. A procedure of this kind would (*a*) permit supplying the islands with fresh provisions, (*b*) obviate any deficiency which might arise in the stock of staple supplies, (*c*) effect the transfer of mail, and (*d*) afford a welcome relief to the Government employees from the enforced monotony of the long winter season.

In accordance with the law, arrangements were made by the Coast Guard Service for the patrol of the North Pacific Ocean and Bering Sea during the season of 1915 by vessels of that service. The *Unalga* was designated to patrol the waters between Kodiak Island and the western end of the Aleutian Chain from the beginning of the season until July 15. The *Manning* was designated to relieve the *Unalga* July 15 and patrol the Bering Sea until the end of September. The vessels were to visit the Pribilofs from time to time for the purpose of conveying mail from Unalaska to those islands. In June, 1915, the agent on St. Paul Island reported to the *Unalga* that there were evidences of poachers in the vicinity of that island (reports were also made by him directly to the Bureau) and a careful search was undertaken by that vessel, but with only negative results.

MINOR FUR-BEARING ANIMALS.

With the limited force and funds available, the Bureau has administered as thoroughly as practicable the laws and regulations pertaining to the minor fur-bearing animals of Alaska, whose aggregate value and importance exceed the fur seal at present. The number of wardens for this service was increased from 5 to 7 in the fiscal year 1915, and in addition thereto one special fur warden previously employed was continued at a nominal salary.

In May, 1915, the Department approved a revision of the regulations for the protection of fur-bearing animals in Alaska as recommended by the Bureau; and under date of May 24, 1915, these regulations were issued (Department Circular no. 246, third edition). The principal features of the new regulations are as follows:

No change of seasons for the killing of fur-bearing animals was made; prohibition was placed upon the use of "klips" and the steel bear trap or any other trap with jaws having a spread exceeding 8 inches; no attempt was made to place restrictions upon the taking of fur-bearing animals alive, so long as no killing was involved; the shipping of live fur-bearing animals from Alaska was not interdicted; and the requirement that persons engaged in fur farming should secure a license from the Department was discontinued.

At the end of the fiscal year four of the Alaska Islands which the Department may lease for fur-farming purposes were so leased. The plan of supplying blue foxes for breeding purposes from the Pribilof Islands has not been continued since the summer of 1914. In addition to the difficulty experienced in making deliveries of live animals from this remote region, it was felt that the conditions of the herds did not warrant depleting them of the best potential breeding elements, which animals the prospective breeders would naturally require. A portion of the animals sold in 1914 were taken to a ranch in Michigan; they have not yet bred in their new environment, and the results of the venture are awaited with interest.

The total value of the minor furs sent out of Alaska in the year ending November 15, 1914, was approximately $650,000. The two most conspicuous furs as regards aggregate value are red fox and mink, although white fox, lynx, muskrat, and marten are also important. It is a pleasure to be able to report a rapid increase in beavers in southeastern Alaska and in various parts of the interior; and a further marked increase may confidently be expected as a result of the prohibition of the killing of beavers until November 1, 1918.

In view of the incongruity of including strictly terrestrial animals in a bureau devoted to aquatic animals and the fisheries, it is believed that Congress should make early provision for a change in the administration of the laws pertaining to the minor fur-bearing animals of Alaska, in accordance with recommendations that have been made in former reports. Aside from the question of administration, there are anomalies and inconsistencies in the existing laws that call for immediate attention; and, furthermore, the general act protecting the fur bearers is fundamentally defective.

This matter has been taken up by the Departments of Commerce and Agriculture through a committee of four persons representing the Bureau of Fisheries and the Bureau of Biological Survey, and an agreement has been reached under which an appeal will be made to Congress for a proper allocation of duties in the two departments. The recommendations of the committee, submitted April 10, 1915, and approved by the respective Secretaries, provide (1) that Congress be requested to order the transfer to the Department of Agriculture of jurisdiction over the terrestrial fur-bearing animals of Alaska now exercised by the Department of Commerce; and (2) that at the same time the Department of Commerce should be given exclusive jurisdiction over all aquatic or amphibious animals whose pursuit constitutes a fishery, such as walrus, whales, porpoises, and sea lions, in addition to fur seals and sea otters.

MISCELLANEOUS MATTERS.

MOVEMENTS OF VESSELS.

In June, 1914, the *Albatross* was dispatched to the Pribilof Islands with the Deputy Commissioner, who subsequently used the vessel for an inspection of the fisheries in parts of central and western Alaska. On August 15 the Deputy Commissioner disembarked at Juneau, and the vessel immediately returned to Seattle and, after some refitting, resumed the investigation of the halibut banks off Washington and Oregon which had been in progress during the preceding year. This work was completed for the season on September 9, when the ship was sent to Sausalito and there laid up for the balance of the year, as lack of funds prevented any further activities. From the inception of the halibut investigation in April, 1914, till the arrival at Sausalito, September 16, the vessel steamed 11,005 miles.

The auxiliary schooner *Grampus* continued during the summer of 1914 the oceanographic investigations in the Gulf of Maine and as far south as Nantucket. During the fall and winter the schooner was laid up, and the crew were employed to assist in the fish-cultural work of the Gloucester station. On May 4, 1915, the offshore work of the preceding year was resumed and was in progress on June 30.

The *Fish Hawk* was employed in surveying offshore fishing grounds in connection with the Beaufort laboratory in the summer of 1914, and in December was sent to the west coast of Florida for use in the oyster-grounds survey authorized by Congress. This work was duly completed, and on May 13 the vessel arrived at Norfolk, Va., where, after overhauling and refitting, preparations for further service on the North Carolina coast were made. During the year the vessel steamed about 5,000 miles.

The *Osprey* was engaged in the usual patrol work in southwestern Alaska, and was utilized by the Deputy Commissioner during his inspection trip to that region in the summer of 1914.

The *Phalarope* was attached to the Woods Hole station during most of the year, and was utilized in connection with both the fish-cultural and biological work. In the spring of 1915 the vessel was detailed, as heretofore, to assist in the shad hatching on the Potomac River.

The *Curlew* was engaged in the rescuing of fishes from the overflow waters of the Mississippi River and in the propagation of pearl mussels.

VESSEL FOR ALASKA SERVICE.

The well-known arctic-exploration steamer *Roosevelt* has been purchased in New York for the Alaska service, and has undergone a general overhauling, including the substitution of oil-burning for coal-burning machinery. The vessel started for the Pacific coast on July 19, after a trial trip; but on the run from New York to Norfolk, where a cargo of coal for the Pribilof Islands was to be taken aboard, certain unforeseen defects in machinery developed, and it was necessary to send the vessel to the Norfolk Navy Yard for a thorough inspection and special repairs, which have delayed the departure for the Pacific coast.

NEW VESSEL FOR THE MAINE COAST.

A special appropriation of $45,000, for a vessel for the Boothbay Harbor station, was made immediately available in the sundry civil appropriation act approved March 4, 1915. It was thought at first that it would be possible to purchase a suitable craft in first-class condition at a less price than one could be built for, and with the added advantage that she would be available for immediate use. Exhaustive inquiries at all practicable shipping ports were accordingly made, and many offerings were considered, but without finding a satisfactory vessel. The experience of this and other bureaus has shown that in general the policy of purchasing second-hand vessels is unwise. Such vessels are never primarily suited for the Bureau's purposes, and to rebuild them is an expensive matter, with final unsatisfactory results. Ordinarily, too, if they are in first-class condition, they are not cheap. It was, therefore, finally decided to build a new vessel designed not only for the local activities of the Boothbay station but also for offshore research, surveys, and exploitation of the fisheries. Plans are now being prepared in the Bureau of Lighthouses, and as soon as completed bids for the construction will be called for.

NEW ESTABLISHMENTS AND CONSTRUCTION.

The sites for the new hatchery in Utah and the new biological laboratory in Florida had not yet been acquired at the end of the fiscal year owing to delays on the part of the owners in furnishing titles satisfactory to the Department of Justice. No title has yet been obtained for the additional land which is to be acquired for the Cold Spring station in Georgia.

The work of reconstructing the wharves and building a retaining bulkhead at the Woods Hole station has been placed under the supervision of Army engineers. The new wharves, while less extensive than the older ones, will be of ample capacity for the Bureau's needs and will be much less expensive to maintain. The demolition of the coal shed has been made necessary by its location on the old wharf.

At Saratoga, Wyo., a hatchery, a superintendent's dwelling, and a cottage for the fish culturist have been nearly completed; work is also well advanced on the pond and drainage systems; and a railroad siding is being built.

The biological station at Beaufort, N. C., has been extensively repaired and put in first-class order with a small appropriation granted by the last Congress. The wooden underpinning of the laboratory has been replaced with brick; a veranda has been added on the south front; new salt-water plumbing has been installed; the buildings have been repainted; general repairs have been made; the protecting sea wall has been extended; and the grounds have been graded, planted, and put in thorough order. A terrapin pond and large fish pool have been added to the plant.

At Edenton, N. C., a mess house, 25 feet square, suitably arranged for the necessary quarters, is under construction with the special appropriation made at the last session of Congress.

In an effort to relieve the crowded condition of the offices in the Bureau's building in Washington, part of the space on the ground floor, heretofore occupied by Central Station for fish-hatching and other purposes, has been converted into six new office rooms separated by a double row of aquarium tanks leading into the grotto. A new ceiling and new floor have been laid, the seal pool has been reconstructed and enlarged, and a small space has been reserved for fish-hatching operations and an exhibit of some of the activities of the Bureau.

FISHERY MATTERS IN CONGRESS.

By a joint resolution approved February 24, 1915, the Secretary of Commerce was authorized to postpone the sale of all skins in possession of the Government taken from seals killed on the Pribilof Islands for food purposes until such time as, in his discretion, he shall deem advisable.

A bill was passed on February 18, 1915, authorizing the Secretary of Commerce, through the Coast and Geodetic Survey and the Bureau of Fisheries, to make a survey of oyster beds in the State of Texas. Owing to a defect which imposed an unintended financial burden on the Bureau, the bill was withdrawn by the Senate after it had been sent to the President for approval, and was not reenacted.

Defects in the law of June 20, 1906, for the protection of sponges were corrected in a bill which passed both Houses and was approved August 15, 1914. This law, which was advocated by the Bureau, regulates the taking of sponges in extraterritorial waters of the coast of Florida. The principal provision of the act is the limiting of the size of sponges that may be taken, or landed, cured, offered for sale, or had in possession to 5 inches in maximum diameter.

A bill to prohibit interstate and foreign commerce in lobster meat and in undersized or egg-bearing lobsters was introduced in the House on July 2, 1914, and referred to the Committee on Interstate and Foreign Commerce.

A bill approved by this Bureau authorizing the Commissioner of Fisheries to conduct investigations and experiments for ameliorating the damage wrought to the fisheries by predaceous fishes and other aquatic animals was introduced in the House and recommended by the Committee on the Merchant Marine and Fisheries. This bill was so amended on the floor of the House before it passed that body as to leave the Bureau with fewer powers than it already possessed, and it failed of passage in the Senate.

The Sixty-third Congress expired without making effective the treaty of April 13, 1908, providing for joint international regulations for the fisheries in the contiguous waters of the United States and Canada. The matter had been pending in Congress since 1910. The present international commissioner on behalf of the United States labored assiduously to meet the objections that had been urged against various features of the regulations and cooperated in the drafting of a bill which fully safeguarded all the interests of the United States fishermen. This failure to respect our treaty obligations leaves the international fisheries in a chaotic condition and leads to the fear that further depletion of international waters will result because of inharmonious laws and incompatible jurisdictions.

In March, 1915, a bill to amend the laws for the protection and regulation of the fisheries of Alaska was introduced in the House, but owing to the imminent adjournment of Congress no action was taken thereon.

PUBLICATIONS AND LIBRARIES.

During the fiscal year the following publications were issued and distributed through the Superintendent of Documents on special mailing lists:

REPORT OF THE COMMISSIONER AND APPENDIXES THERETO.

Report of the Commissioner of Fisheries to the Secretary of Commerce for the fiscal year ended June 30, 1914. 81 p.

The distribution of fish and fish eggs during the fiscal year 1913. Appendix I to Report of Commissioner for 1913. 122 p.

Alaska fisheries and fur industries in 1913. Appendix II to Report of Commissioner for 1913. 172 p.

Experimental study of the growth and migration of fresh-water mussels. By Frederick B. Isely. Appendix III to Report of Commissioner for 1913. 24 p., 3 pl.

Experiments in propagation of fresh-water mussels of the Quadrula group. By Arthur Day Howard. Appendix IV to Report of Commissioner for 1913. 52 p., 6 pl.

The mussel fauna of central and northern Minnesota. By Charles B. Wilson and Ernest Danglade. Appendix V to Report of Commissioner for 1913. 26 p., 1 map.

The mussel resources of the Illinois River, by Ernest Danglade. The mussel fishery of the Fox River, by John A. Eldridge. Appendixes VI and VII to Report of Commissioner for 1913. 48 p., 5 pl., 2 text fig., chart, 8 p.

Water-power development in relation to fishes and mussels of the Mississippi. By Robert E. Coker. Appendix VIII to Report of Commissioner for 1913. 28 p., 6 pl.

The distribution of fish and fish eggs during the fiscal year 1914. Appendix I to Report of Commissioner for 1914. 114 p.

Condition and extent of the natural oyster beds and barren bottoms of Lavaca Bay, Tex. By H. F. Moore and Ernest Danglade. Appendix II to Report of Commissioner for 1914. 45 p., 5 pl., 1 chart.

Menhaden industry of the Atlantic coast. By Rob Leon Greer. Appendix III to Report of Commissioner for 1914. 27 p., 7 pl.

Mussel resources in tributaries of the upper Missouri River. By Robert E. Coker and John B. Southall. Appendix IV to Report of Commissioner for 1914. 17 p., 1 pl., 1 map.

Identification of the glochidia of fresh-water mussels. By Thaddeus Surber. Appendix V to Report of Commissioner for 1914. 9 p., 1 pl.

Otter-trawl fishery. By A. B. Alexander, H. F. Moore, and W. C. Kendall. Appendix VI to Report of Commissioner for 1914. 97 p., 9 text fig., 1 chart, 1 diag.

Survey of the fishing grounds on the coasts of Washington and Oregon in 1914. By Waldo L. Schmitt, E. C. Johnston, E. P. Rankin, and Edward Driscoll. Appendix VII to Report of Commissioner for 1914. 30 p., 1 pl., 2 charts, 1 paster.

The Fishes of the Yellowstone National Park. By W. C. Kendall. Appendix VIII to Report of Commissioner for 1914. 28 p., 17 text figs.

BULLETIN OF THE BUREAU OF FISHERIES.

A limnological study of the Finger Lakes of New York. By Edward A. Birge and Chancey Juday. Bulletin, vol. XXXII, 1912, p. 525–610, 23 text fig., pl. CXI–CXVI (maps).

The embryology and larval development of Bairdiella chrysura and Anchovia mitchilli. By Albert Kuntz. Bulletin, vol. XXXIII, 1913, p. 1–20, 46 text fig.

The skeletal musculature of the king salmon. By Charles Wilson Greene and Carl Hartley Greene. Bulletin, vol. XXXIII, 1913, p. 21–60, pl. I–II, 14 text fig.

The directive influence of the sense of smell in the dogfish. By G. H. Parker. Bulletin, vol. XXXIII, 1913, p. 61–68.

The storage of fat in the muscular tissue of the king salmon and its resorption during the fast of the spawning migration. By Charles W. Greene. Bulletin, vol. XXXIII, 1913, p. 69–138, pl. III–XI.

Correlations of weight, length, and other body measurements in the weakfish, Cynosion regalis. By William J. Crozier and Selig Hecht. Bulletin, vol. XXXIII, 1913, p. 139–148, 4 text fig.

The fat-absorbing function of the alimentary tract of the king salmon. By Charles W. Greene. Bulletin, vol. XXXIII, 1913, p. 149–176, pl. XII–XV.

Notes on the habits, morphology of the reproductive organs, and embryology of the viviparous fish Gambusia affinis. By Albert Kuntz. Bulletin, vol. XXXIII, 1913, p. 177–190, pl. XVI–XIX.

Sporozoön parisites of certain fishes in the vicinity of Woods Hole, Mass. By C. W. Hahn. Bulletin, vol. XXXIII, 1913, p. 191–214, pl. XX–XXI.

Fur seals and other life in the Pribilof Islands, Alaska, in 1914. By Wilfred H. Osgood, Edward A. Preble, and George H. Parker. Bulletin, vol. XXXIV, 1914, p. 1–172, pl. I–XVIII, 24 maps.

SPECIAL PUBLICATION.

Report of Alaska investigations in 1914. By E. Lester Jones, 155 p., illus.

ECONOMIC CIRCULARS.

Commercial possibilities of the goosefish, a neglected food; with 10 recipes. 5 p. Dec. 15, 1914.

Mussel resources of the Tensas River of Louisiana. 7 p. April 9, 1915.

The common and scientific names of fresh-water mussels. 4 p. April 8, 1915.

Concerning the mortality of the soft clams at Essex, Mass. 4 p., illus. April 18, 1915.

STATISTICAL BULLETINS.

Monthly statements showing by species and fishing grounds the quantity and values of certain fishery products landed at Boston and Gloucester, Mass., by American fishing vessels. 1-sheet bulletin.

Statement, by months, of the quantities and values of certain fishery products landed at Boston and Gloucester, Mass., by American fishing vessels during the year 1914. 1-sheet bulletin.

Statement, by fishing grounds, of the quantities and values of certain fishery products landed at Boston and Gloucester, Mass., by American fishing vessels during the calendar year 1914. 1-sheet bulletin.

Fresh-water pearl button industry of the United States in 1912. 1-sheet bulletin.

Fresh-water mussel fishery of streams tributary to the Great Lakes and the Ohio and Mississippi Rivers north of the Ohio and east of the Mississippi River in 1913. 1-sheet bulletin.

Lobster fishery of the Atlantic Coast States in 1913. 1-sheet bulletin.

Beginning with June, 1915, a monthly publication, entitled Fisheries Service Bulletin, was started and seems destined to serve a useful purpose. The objects, as stated in the first issue, are to bring into closer touch the headquarters and the field service and to establish a means of official communication between the administrative offices and all employees. The publication is supplied to each employee of the Bureau, to State fishery authorities, to the press, and to private individuals interested or identified with the fisheries in their broad aspects.

The Bureau has at its headquarters in Washington a library reputed to be the most complete in the world in publications on the fisheries and related subjects. Auxiliary libraries are maintained at the laboratories at Woods Hole, Mass., Beaufort, N. C., and Fairport, Iowa, and there is a small but well-selected collection of books on the Fisheries steamer *Albatross* on the Pacific coast. The main library contains over 29,000 volumes, that at Woods Hole about 2,000, and those at Beaufort and Fairport about 1,000 each. All are being rapidly augmented by purchase and exchange. These publications are intended primarily for workers in the Bureau's service, but the public is encouraged to use them. Many works available nowhere else in the United States may be consulted in these libraries, which are well catalogued, and the librarian in Washington and the directors of the several laboratories will render all possible assistance to inquirers.

APPROPRIATIONS.

The appropriations for the conduct of the Bureau for the fiscal year 1915 aggregated $1,118,471.66, as follows:

Salaries	$387,971.66
Miscellaneous expenses:	
Administration	10,000.00
Propagation of food fishes	350,000.00
Inquiry respecting food fishes	45,000.00
Statistical inquiry	7,500.00
Maintenance of vessels	60,000.00
Protecting the sponge fisheries	3,500.00
Protecting seal and salmon fisheries of Alaska	110,000.00
Construction or purchase of vessels, Alaska service	50,000.00
Completion of, extension of, and improvements at fish-cultural and biological stations:	
Utah	25,000.00
Cold Spring, Ga	6,000.00
Woods Hole, Mass	40,000.00
Clackamas, Oreg	15,000.00
Beaufort, N. C	5,000.00
Edenton, N. C	3,500.00

SOME NEEDS OF THE SERVICE.

In the estimates of appropriations for 1917 which have been submitted for the approval of the Secretary, provision is made for a readjustment of the salaries of a number of underpaid positions, including the superintendent of the car and messenger service, directors of biological stations, and superintendents of hatcheries. The increases which are recommended in these cases are demanded by the nature and responsibility of the services required and by the fact that similar positions in other Government bureaus and in private establishments command much higher salaries. The compensation now fixed by law for the superintendents of most of the stations is less than was paid 20 years ago, notwithstanding a very marked increase in the work required of and performed by them. The Bureau is often unable to secure or retain the services of technically qualified assistants of great value to the work because the salaries carried by the positions are less attractive than those offered by other Government departments, by the various States, by foreign governments, and by private establishments. The constant loss of trained men is a serious impairment of efficiency, and demands a proper adjustment of the salaries of various statutory positions other than those already referred to.

Recommendation is made for a reorganization of the administrative personnel on the Pribilof Islands, Alaska, involving the creation of new positions and an increase in the compensation of the chief officer on each island. This recommendation, which is embodied in the estimates of appropriations for 1917, is based on the experience of the Bureau. The very large Government property interests at stake, the international rights in the seal herd, and the welfare of the native community, justify more liberal expenditures than have ever been made for the fur-seal service.

The Bureau of Fisheries occupies the anomalous position of having its two most important vessels officered and manned by another department of the Government. The circumstances are as follows: Since the construction of the steamer *Fish Hawk* in 1879 and the steamer *Albatross* in 1882, these vessels have had naval crews under authority conveyed by law (21 Stats., 151). The naval personnel of the *Fish Hawk* at this time consists of 44 officers and men, the commanding officer being a chief boatswain. The naval personnel of the *Albatross* numbers 81 officers and men, the commanding officer being a lieutenant-commander. The annual salaries of the naval personnel of these two vessels, including the allowance for subsistence, are approximately $102,000.

A careful consideration of the requirements of the Bureau indicates that a material reduction in the personnel of these vessels may be effected if civilian officers and crews are substituted for naval officers and crews. In the case of the *Albatross* it is found that 35 men as against 81 men will be ample, and in the case of the *Fish Hawk* that 26 men as against 44 men will suffice. The annual cost of the proposed civilian officers and crews would be $56,292.50, exclusive of any allowance for subsistence, for which there is no authority of law in this service.

The Navy Department from the outset has been most liberal in providing efficient officers and crews for these two vessels, and this Bureau is under the most profound obligations for this invaluable cooperation. However, in view of the foregoing statements, and because of the intimation that has from time to time come from the Navy Department that its officers and men are needed for service on naval vessels, it is believed that Congress should be asked to authorize civilian crews. To this end an item has been inserted in the estimates of appropriations for the next fiscal year.

The placing of the *Albatross* and *Fish Hawk* under civilian management will be an opportune time for the reorganization of the personnel of the entire vessel service, so as to put the Bureau of Fisheries on a par with the Bureau of Lighthouses and the Coast and Geodetic Survey. This is demanded in the interests of efficiency and economy. It appears that a reorganization that will afford sufficient men for the vessels, and allow them compensation which will be an inducement for efficient men to remain in the service, can be accomplished at an annual saving of $25,000 to $30,000. With this in view, there has been included in the estimates of appropriations for 1917 an item for a lump-sum appropriation to cover the compensation of all vessel employees instead of specific provision for the personnel of each vessel, as at present. The Bureau of Fisheries appears to be the only bureau in the Department of Commerce whose vessel employees are not given an allowance for subsistence. Congress should therefore be requested to authorize the vessel personnel of the Bureau of Fisheries to enjoy the same status accorded in other bureaus.

Comparatively small increases are required in the appropriations for propagation of food fishes, inquiry respecting food fishes and fishing grounds, and statistical inquiry, in order that existing agencies may be fully utilized and opportunity be afforded for extending the scope and increasing the usefulness of the various activities of the Bureau. A very substantial increase in the appropriation for the maintenance of vessels is imperative, so that costly vessel property may not be forced to remain idle when much important work should be done. The case of the *Albatross* in the year 1914–15 may be cited, but the conditions then were not peculiar, only exaggerated. This vessel, with a crew of 85 officers and men, was laid up during about three-fourths of the year, when less than $10,000 would have enabled the Department to keep her in service and make needed investigations during the time when the pay of the naval crew and other permanent charges against the vessel exceeded $30,000.

The welfare of the lobster industry demands at the hands of the Federal Government the immediate rendering of the most effective form of assistance that can be extended to the States. Experience and investigation have amply demonstrated that the mere hatching and planting of the lobster fry is inadequate to maintain the supply in the face of an increasing demand, inharmonious laws not consistently enforced or generally respected by the fishermen, and the strong inducement to violation of law occasioned by the high prices. There are a genuine need and a legitimate public demand for lobster rearing as a supplement to or substitute for the present operations of the lobster hatcheries, and an item for a rearing plant has been included in the Bureau's estimates of appropriations for the next fiscal year.

Representations made in former years regarding the need for a new building with ample laboratory and aquarium facilities are strongly renewed.

Respectfully,

H. M. SMITH,
Commissioner.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1915

ROBERT S. JOHNSON
Assistant in Charge of Fish Culture

Appendix I to the Report of the U. S. Commissioner
of Fisheries for 1915

CONTENTS.

	Page.
Character of the work	5
Method of distribution	6
Size of fish when distributed	7
Size of allotments	8
Species cultivated	8
Summarized statement of distribution	10
Summary by species	10
Allotments to State fish commissions	11
Shipments to insular possessions and foreign countries	13
Details of output for 1915	13
Stations operated and the output of each	13
List of egg-collecting stations	19
Details of distribution of fish and fish eggs	20
Fresh-water mussel propagation	138

INDEX TO SPECIES DISTRIBUTED.

	Page.
Alewife	23
Atlantic salmon	41
Black bass, largemouth	99
Black bass, smallmouth	96
Blackspotted trout	42
Blueback salmon	26
Brook trout	51
Buffalofish	23
Carp	22
Catfish	20
Chinook salmon	25
Cod	136
Crappie	88
Dog salmon	26
Flatfish	137
Fresh-water drum	23
Grayling	88
Haddock	136
Humpback salmon	26
Lake herring (cisco)	24
Lake trout	50
Landlocked salmon	41
Largemouth black bass	99
Lobster	137
Loch Leven trout	49
Mackerel	136
Mussels	138
Pike and pickerel	129
Pike perch	129
Pollock	136
Rainbow trout	28
Rock bass	94
Scotch sea trout	42
Shad	23
Silver salmon	25
Smallmouth black bass	96
Smelt	88
Steelhead trout	27
Strawberry bass	94
Striped bass	134
Sunfish (bream)	122
Tautog	137
Whitefish	24
White bass	135
White perch	135
Yellow bass	136
Yellow perch	133
Yellow sucker	22

THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1915.

CHARACTER OF THE WORK.

The fish-cultural work of the Bureau of Fisheries may be said to have two general objects—the restoration and maintenance of the commercial fisheries of the country and the stocking of its interior waters with the more important food and game fishes to which they are adapted. In the prosecution of the former of these objects, which is concerned with the salmons, whitefish, lake trout, pike perch, shad, white perch, yellow perch, cod, lobster, pollock, and other commercial species, the Bureau acts on its own initiative, carefully planning its distribution of young fish with the view of conserving and increasing the importance of existing fisheries and of establishing a basis for their extension through the systematic annual planting of fish of suitable species in fertile but unproductive fields.

In that part of its work which relates to the stocking of interior lakes and streams the Bureau solicits the participation of the public. It cooperates with individuals or associations who may be interested in deciding as to the waters to be stocked, considers their suggestions as to the species of fish best suited therefor, and relies upon them to see that the fish furnished are properly planted in the waters for which they are assigned.

While this branch of the work is relatively small, constituting only about 5 per cent of the annual output, the benefits accruing therefrom are considered invaluable, not only in the economic sense of increasing the food supply by the utilization of many waters heretofore unproductive, but also because of their educational effect in developing and fostering a sentiment favorable to the protection and growth of the fisheries. The fishes principally produced for such waters are several of the native trouts, the grayling, the black basses, crappies, sunfishes, and catfishes.

Owing to the practicability of hatching the eggs of the trouts by artificial means, the demands for such species can readily be supplied. On the other hand, the resources for the production of the warm-water species, commonly known as "pond fishes," are extremely limited, and it is with the greatest difficulty that the insistent and growing demands for them can be met. These fishes must of necessity be cultivated naturally in open ponds, where the eggs and young are subjected to many hazards, chief among them being sudden temperature changes, turbidity of the water after heavy rains, ravages of snakes and other enemies, and depletion of the stock through cannabalism, all of which conditions can be mitigated or controlled only in part. The harvest is therefore uncertain, and the output of one year can not be used as a standard on which to base estimates of succeeding seasons.

For many years the Bureau has been doing a valuable work of conservation by rescuing vast numbers of black bass and other native fishes from the temporary pools and bayous formed by the annual flooding of certain navigable interstate rivers, and at the same time has been able to secure considerable numbers of young pond fishes for general distribution. In the conduct of this work it has been the Bureau's policy to remove fish only from such places as will dry up or freeze solidly before a recurring high-water stage, returning to the main rivers the bulk of the collections and utilizing any surplus to supplement its supplies for shipment to applicants. As in the pond fish-cultural work at its stations, the degree of success attending the seining operations depends largely upon climatic conditions, and occasionally the work proves a total failure because of the inaccessibility of the spawning grounds, owing to the extremely high or low water stages prevailing.

METHOD OF DISTRIBUTION.

Almost the entire output of young fish of the commercial species handled by the Bureau is returned to the original sources of supply or liberated in other public waters where conditions are favorable to the establishment of new fisheries. Where eggs or fish for stock purposes are derived from interior waters especial care is taken to return to such waters a sufficient number of young fish of like species to insure the maintenance of the supply. The remainder of the stock available is then allotted on individual applications, bearing the indorsement of a United States Senator or Representative, such applications being submitted on a blank form furnished by the Bureau, which among other things calls for a detailed description of the waters for which fish are desired. In passing upon applications the preference of the applicants as to species assigned is taken into account, but the Bureau reserves the right of final decision of this question, taking into consideration not only the character of the waters, but the welfare of existing local fisheries, and selecting such species of fish as will not be likely to prove injurious to or be injured by those already established.

In general the assignment of nonindigenous fishes is made only with the approval of the fisheries authorities of the States concerned. In this connection it may be stated that the Bureau has recently decided to refuse all requests for predaceous fishes for stocking waters in California, Oregon, Washington, Idaho, Nevada, and the western portions of Montana and Wyoming, which proscribed section embraces the most valuable salmon and trout fisheries of the United States.

The fish are carried to their destinations in railroad cars equipped for the purpose or by messengers who accompany the shipments in baggage cars, and are delivered to the applicant free of charge at the railroad station nearest the point of deposit. The applicant is advised by telegraph when the shipment will arrive and is expected to make due provision for the care of the fish until planted. Definite instructions in this respect are furnished at the time of shipment.

During the fiscal year ended June 30, 1915, the Bureau received 10,622 applications from individuals and associations, for fish to stock both public and private waters. Requests for blanks upon which to submit applications for fish should be addressed to the Commissioner of Fisheries, Washington, D. C.

It is the practice of the Bureau to fill all applications in the order in which they are received and to arrange for the delivery of the fish as soon as practicable thereafter.

SIZE OF FISH WHEN DISTRIBUTED.

Fish are distributed at various stages of development, depending upon the species, the numbers available, and the facilities for rearing. Shad, whitefish, lake trout, pike perch, cod, and other species which are hatched in lots of many millions are necessarily planted shortly after hatching. The various trouts, the Atlantic salmon, and the landlocked salmon are reared in such numbers as facilities permit to fingerlings from 1 to 6 inches in length; the remainder are distributed as fry.[a]

The black basses, crappies, and other sunfishes are distributed at various ages—some within three weeks after they are hatched and some when several months old. Near the end of the distribution season the basses have usually attained a length of from 4 to 6 inches and the sunfishes are from 2 to 4 inches long. The bass, catfish, and other species collected from overflowed lands vary from 2 to 6 inches in length when taken and distributed.

Eggs are supplied mainly to State hatcheries, but are occasionally furnished to private applicants having hatching facilities with the understanding that the young fish resulting therefrom are to be distributed in public waters. The Bureau does not furnish eggs for stocking hatcheries whose output is regularly offered for sale.

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[a] The varying usage in the classification of young fish as to size has caused such confusion and difficulty that the Bureau has adopted uniform definitions, as follows:

Fry—fish up to the time the yolk sac is absorbed and feeding begins.

Advanced fry—fish from the end of the fry period until they have reached a length of 1 inch.

Fingerlings—fish between the length of 1 inch and the yearling stage, the various sizes to be designated as follows: No. 1, a fish 1 inch in length and up to 2 inches; no. 2, a fish 2 inches in length and up to 3 inches; no. 3, a fish 3 inches in length and up to 4 inches, etc.

Yearlings—fish that are 1 year old, but less than 2 years old from the date of hatching; these may be designated no. 1, no. 2, no. 3, etc., after the plan prescribed for fingerlings.

SIZE OF ALLOTMENTS.

It is customary to assign but one species of fish on an application, and only one application for the stocking of a body of water at a given point is considered. The number of fish assigned on an application is based upon the water area described, only a sufficient number being allowed to serve as a brood stock, with the understanding that the waters in which they are to be placed will be properly protected until the fish have had time to mature and establish themselves through natural reproduction. The actual number assigned is also dependent upon the species, the size of the fish, and the number available for distribution. In the case of the various trouts 250 fish 2 inches in length, or 50 fish 6 inches in length, are fully equal to 2,500 fry for stocking purposes. Pike perch, which, owing to their excessive cannibalism, can not be reared beyond the fry stage, may be supplied in lots of half a million, where the same water area would receive only 200 or 300 young bass from 2 to 5 inches long. The larger fish have a much better chance of reaching maturity than have the fry, and therefore their value for stocking purposes is many times greater.

Owing to the Bureau's inability to produce the black basses, crappies, catfishes, and sunfishes in sufficient numbers to meet the demands, the allotments of such species are of necessity limited to the smallest number required to form a brood stock for the water area in question.

SPECIES CULTIVATED.

During the fiscal year 1915 the Bureau handled some 50 species of fish, the fresh-water mussel, and the lobster. Of these the following were produced at its regular propagating stations:

THE CATFISHES (SILURIDÆ):
- Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*).
- Marbled cat (*Ameiurus nebulosus marmoratus*).

THE SUCKERS AND BUFFALOFISHES (CATOSTOMIDÆ):
- Smallmouth buffalofish (*Ictiobus bubalus*).
- Common buffalofish (*Ictiobus cyprinella*).
- Black buffalofish (*Ictiobus urus*).
- Yellow sucker (*Catostomus commersonii*).

THE SHADS AND HERRINGS (CLUPEIDÆ):
- Shad (*Alosa sapidissima*).
- Glut herring, blueback (*Pomolobus æstivalis*).

THE SALMONS, TROUTS, WHITEFISHES, ETC. (SALMONIDÆ):
- Common whitefish (*Coregonus albus* and *C. clupeaformis*).
- Lake herring, cisco (*Leucichthys artedi*).
- Chinook salmon, king salmon, quinnat salmon (*Oncorhynchus tschawytscha*).

THE SALMONS, TROUTS, WHITEFISHES, ETC.—Continued
- Silver salmon, coho (*Oncorhynchus kisutch*).
- Blueback salmon, redfish, sockeye (*Oncorhynchus nerka*).
- Humpback salmon (*Oncorhynchus gorbuscha*).
- Dog salmon (*Oncorhynchus keta*).
- Steelhead trout, hardhead (*Salmo gairdneri*).
- Rainbow trout (*Salmo irideus*).
- Atlantic salmon (*Salmo salar*).
- Landlocked salmon (*Salmo sebago*).
- Blackspotted trouts: Yellowstone Lake trout or cut-throat trout (*Salmo lewisi*). Tahoe trout (*Salmo henshawi*).
- Scotch sea trout (*Salmo trutta*). Introduced species.
- Loch Leven trout (*Salmo trutta levenensis*). Introduced species, propagated in limited numbers for observation.
- Lake trout, Mackinaw trout, longe, togue (*Cristivomer namaycush*).
- Brook trout, speckled trout (*Salvelinus fontinalis*).

THE GRAYLINGS (THYMALLIDÆ):
- Montana grayling (*Thymallus montanus*).

THE MACKERELS (SCOMBRIDÆ):
- Common mackerel (*Scomber scombrus*).

THE SMELTS (ARGENTINIDÆ):
- American smelt (*Osmerus mordax*).

THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):
- Crappie (*Pomoxis annularis*).
- Strawberry bass, calico bass ((*Pomoxis sparoides*).
- Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*).
- Warmouth, goggle-eye (*Chænobryttus gulosus*).
- Smallmouth black bass (*Micropterus dolomieu*).
- Largemouth black bass (*Micropterus salmoides*).
- Bluegill bream, bluegill sunfish (*Lepomis incisor*).
- Other sunfishes, chiefly *Eupomotis gibbosus*.

THE PERCHES (PERCIDÆ):
- Pike perch, wall-eyed pike, yellow pike, blue pike (*Stizostedion vitreum*).
- Yellow perch, ring perch (*Perca flavescens*).

THE SEA BASSES (SERRANIDÆ):
- Striped bass, rockfish (*Roccus lineatus*).
- White perch (*Morone americana*).

THE CODS (GADIDÆ):
- Cod (*Gadus callarias*).
- Haddock (*Melanogrammus æglifinus*).
- Pollock (*Pollachius virens*).

THE FLOUNDERS (PLEURONECTIDÆ):
- Winter flounder, American flatfish (*Pseudopleuronectes americanus*).

THE LABRIDS (LABRIDÆ):
- Tautog, blackfish (*Tautoga onitis*).

CRUSTACEANS:
- American lobster (*Homarus americanus*).

The fishes rescued from overflowed lands in the Mississippi Basin and returned to the original streams were as follows:

THE CATFISHES (SILURIDÆ):
- Spotted cat, blue cat, channel cat (*Ictalurus punctatus*). Only limited numbers obtainable.
- Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*).

THE SUCKERS AND BUFFALOFISHES (CATOSTOMIDÆ):
- Smallmouth buffalofish (*Ictiobus bubalus*).
- Common buffalofish (*Ictiobus cyprinella*).
- Black buffalofish (*Ictiobus urus*).

THE MINNOWS AND CARPS (CYPRINIDÆ):
- Carp (*Cyprinus carpio*). Distributed in rare instances on special request and for waters unsuited to other species.

THE PIKES AND PICKERELS (ESOCIDÆ):
- Pike (*Esox lucius*). Restored to the streams; not distributed.
- Pickerel (*Esox reticulatus*). Restored to the streams; not distributed.

THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):
- Crappie (*Pomoxis annularis*).
- Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*).
- Warmouth, goggle-eye (*Chænobryttus gulosus*).
- Largemouth black bass (*Micropterus salmoides*).
- Smallmouth black bass (*Micropterus dolomieu*).
- Bluegill bream, bluegill sunfish (*Lepomis incisor*).
- Other sunfishes, chiefly *Eupomotis gibbosus*.

THE PERCHES (PERCIDÆ):
- Yellow perch, ring perch (*Perca flavescens*).

THE SEA BASSES (SERRANIDÆ):
- White bass (*Roccus chrysops*).
- Yellow bass (*Morone interrupta*).

Certain introduced species are propagated to a limited extent, as follows:

THE MINNOWS AND CARPS (CYPRINIDÆ):
- Goldfish (*Carassius auratus*). Propagated for ornamental purposes; not distributed.

SUMMARIZED STATEMENT OF DISTRIBUTION.

The following table shows the number of fish and eggs actually distributed during the fiscal year 1915, or, in other words, the output of the hatcheries, with all losses in transportation deducted:

SUMMARY, BY SPECIES, OF THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1915.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Catfish			1,665,793	1,665,793
Carp			644,411	644,411
Yellow sucker			200	200
Buffalofish			114,849	114,849
Fresh-water drum			65	65
Shad		46,009,595		46,009,595
Alewife		4,851,000		4,851,000
Whitefish	98,900,000	405,400,000		504,300,000
Lake herring		92,350,000		92,350,000
Silver salmon	1,948,280	21,204,230	2,756,062	25,908,572
Chinook salmon	34,466,723	44,554,892	16,741,450	95,763,065
Blueback salmon	3,155,000	43,776,741	8,666,255	55,597,996
Humpback salmon		11,758,500	479,037	12,237,537
Dog salmon		35,504,707		35,504,707
Steelhead trout	634,000	2,259,113	3,244,660	6,137,773
Rainbow trout	2,022,990	568,930	2,144,875	4,736,795
Atlantic salmon		1,804,313		1,804,313
Landlocked salmon	291,000	310,042	140,015	741,057
Scotch sea trout		58,430		58,430
Blackspotted trout	3,435,000	1,939,250	4,784,067	10,158,317
Loch Leven trout			48,000	48,000
Lake trout	12,850,000	35,294,723	3,093,745	51,238,468

SUMMARY, BY SPECIES, OF THE DISTRIBUTION OF FISH AND EGGS DURING THE FISCAL YEAR 1915—Continued.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Brook trout	507,150	5,700,263	6,965,167	13,172,580
Smelt	14,500,000	6,900,000		21,400,000
Grayling	350,000	1,873,000		2,223,000
Crappie			1,800,430	1,800,430
Strawberry bass			470	470
Rock bass			414,078	414,078
Smallmouth black bass		653,170	81,177	734,347
Largemouth black bass		758,300	1,431,850	2,190,150
Sunfish		135,000	2,799,766	2,934,766
Pike and pickerel			87,846	87,846
Pike perch	326,350,000	282,820,000	383	609,170,383
Yellow perch	19,000,000	195,267,000	104,287	214,371,287
Striped bass		8,594,500		8,594,500
White perch	17,850,000	161,980,000		179,830,000
White bass			2,825	2,825
Yellow bass			420	420
Cod		260,133,000		260,133,000
Pollock		500,730,000		500,730,000
Mackerel		4,847,000		4,847,000
Haddock		26,814,000		26,814,000
Flatfish		1,294,156,000		1,294,156,000
Tautog		606,000		606,000
Lobster		194,670,000	3,779	194,673,779
Total	536,260,143	3,694,281,699	58,215,962	4,288,757,804

ALLOTMENT OF FISH AND EGGS TO STATE FISH COMMISSIONS FOR FISCAL YEAR 1915.

State and species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
California:			
Brook trout	100,000		
Chinook salmon	34,301,073		
Rainbow trout	497,240		
Silver salmon	1,913,280		
Colorado:			
Blackspotted trout	200,000		200,000
Brook trout			50,000
Delaware:			
Crappie			600
Sunfish			400
Idaho:			
Blackspotted trout	250,000		
Illinois:			
Black bass			4,450
Brook trout			525
Catfish			11,000
Crappie			7,400
Pike perch	15,000,000		
Sunfish			13,500
Yellow perch			3,300
Indiana:			
Pike perch	3,000,000		
Iowa:			
Black bass			3,240
Crappie			5,000
Pike perch	8,000,000		
Sunfish			5,000
Kentucky:			
Pike perch		7,700,000	
Maine:			
Brook trout	100,000		
Lake trout	50,000		
Landlocked salmon	100,000		
Smelt		5,000,000	
Massachusetts:			
Landlocked salmon	15,000		
Pike perch	15,000.000		
Rainbow trout	216,000		
White perch	13,000,000		
Yellow perch	10.000,000		

ALLOTMENT OF FISH AND EGGS TO STATE FISH COMMISSIONS FOR FISCAL YEAR 1915—Continued.

State and species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Michigan:			
Lake trout	3,000,000		
Landlocked salmon	15,000		
Pike perch	26,400,000		
Minnesota:			
Lake trout		100,000	
Steelhead trout	100,000		
Montana:			
Blackspotted trout	400,000		
Lake trout			5,000
Whitefish	1,000,000		
Nebraska:			
Pike perch	2,000,000		
Rainbow trout			20,000
Nevada:			
Brook trout	50,000		
Rainbow trout	100,000		
New Hampshire:			
Brook trout	30,000		
Landlocked salmon	30,000		
New Jersey:			
Black bass			5,125
Crappie			1,050
Landlocked salmon	25,000		
Rainbow trout	100,000		
Steelhead trout	100,000		
Sunfish			2,000
White perch	4,850,000		
Yellow perch	8,000,000		
New Mexico:			
Blackspotted trout	100,000		
New York:			
Lake trout	100,000		
Landlocked salmon	20,000		
North Dakota:			
Black bass			900
Crappie			600
Pike perch	5,000,000		
Rainbow trout	40,000		
Ohio:			
Pike perch	247,450,000		
Whitefish	66,840,000		
Oregon:			
Blackspotted trout	500,000		51,100
Blueback salmon	3,100,000		
Rainbow trout	200,000		
Steelhead trout			27,379
Pennsylvania:			
Lake trout	100,000		
Whitefish	24,560,000		
Utah:			
Blackspotted trout	100,000		
Rainbow trout	100,000		
Vermont:			
Chinook salmon	12,000		
Lake trout	200,000		
Landlocked salmon	30,000		
Smelt	5,000,000		
Steelhead trout	200,000		
Washington:			
Blackspotted trout	400,000		
Blueback salmon	50,000		
Rainbow trout	75,000		
Steelhead trout	100,000		
Wisconsin:			
Lake trout	9,200,000		
Whitefish	6,000,000		
Wyoming:			
Blackspotted trout	700,000		
Brook trout	75,000		
Grayling	50,000		
Lake trout	50,000		
Rainbow trout	75,000		
Steelhead trout	100,000		
Total	518,469,593	12,800,000	417,569

SHIPMENTS OF FISH AND EGGS TO INSULAR POSSESSIONS AND FOREIGN COUNTRIES DURING THE FISCAL YEAR 1915.

Country and species.	Eggs.	Fingerlings, yearlings, and adults.
Cuba:		
Black bass		1,000
India:		
Rainbow trout	40,000	
Japan:		
Rainbow trout	400,000	
Lobsters		100
Porto Rico:		
Black bass		600
Catfish		600
Rock bass		1,200
Sunfish		600
Total	440,000	4,100

DETAILS OF OUTPUT FOR 1915.

The following table shows the work of the different stations in 1915, the periods of operations, and the eggs and fish furnished by each station for distribution. It will be noted that transfers of fish and eggs from station to station are frequent. Such transfers are made in the interest of economy and convenience where the shipments consist of eggs, and give advantageous distribution centers in the case of young fish.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1915.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Afognak, Alaska: [a]					
Entire year	Blueback salmon		942,250	5,444,830	6,387,080
	Humpback salmon		224,000	119,480	343,480
Baird, Cal.:					
Entire year	Chinook salmon			2,875,544	2,875,544
	Silver salmon			226,162	226,162
Battle Creek, Cal.: [a]					
Dec.-Apr.	Chinook salmon	14,968,398		5,001,345	19,969,743
	Silver salmon		209,250		209,250
Hornbrook, Cal.: [a]					
Dec.-May	Chinook salmon	2,831,925			2,831,925
	Rainbow trout	1,097,240	351,480		1,448,720
	Silver salmon	1,913,280	462,490		2,375,770
Mill Creek, Cal.:					
Nov.-Mar	Chinook salmon	16,654,400	5,015,400		21,669,800
Baker Lake, Wash.: [a]					
Entire year	Blueback salmon	55,000	7,255,900		7,310,900
	Chinook salmon		116,000		116,000
	Silver salmon		2,514,000		2,514,000
Birdsview, Wash.: [a]					
Entire year	Blueback salmon	100,000		46,425	146,425
	Chinook salmon			209,694	209,694
	Dog salmon		4,000		4,000
	Humpback salmon		4,750,000		4,750,000
	Silver salmon	35,000	8,165,000	357,300	8,557,300
	Steelhead trout		1,510,700	137,665	1,848,365

[a] For convenience in handling, transfers were made as follows:
Afognak to Green Lake, 3,500,000; to Craig Brook, 3,500,000; to Birdsview, 3,000,000; to Duckabush, 2,000,000; to Quilcene, 500,000 humpback salmon eggs.
Battle Creek to Baird, 781,632 chinook salmon eggs.
Hornbrook to Baird, 250,000; to Battle Creek, 250,000 silver salmon eggs.
Baker Lake to Birdsview, 180,000 blueback salmon eggs.
Birdsview to St. Johnsbury, 50,000; to Spearfish, 25,000; to Duluth, 50,000 steelhead trout eggs.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1915—Contd.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Baker Lake, Wash.—Contd.					
Brinnon, Wash.: [a] Dec.-Mar.	Dog salmon		4,680,500		4,680,500
	Silver salmon		280,700		280,700
Darrington, Wash.: Entire year	Dog salmon		2,545,000		2,545,000
	Silver salmon		2,303,000		2,303,000
Day Creek, Wash.: [a] Entire year	Chinook salmon		40,918		40,918
	Dog salmon		48,097		48,097
	Silver salmon		2,130,095		2,130,095
Duckabush, Wash.: Entire year	Dog salmon		14,465,000		14,465,000
	Humpback salmon		1,820,000		1,820,000
	Silver salmon			37,000	37,000
Illabott Creek, Wash.: [a] Entire year	Chinook salmon		110,885		110,885
	Dog salmon		2,152,110		2,152,110
	Silver salmon		1,306,870		1,306,870
	Steelhead trout		60,000		60,000
Quilcene, Wash.: Entire year	Dog salmon		11,610,000		11,610,000
	Humpback salmon		359,500		359,500
	Silver salmon		390,000	20,600	410,600
	Steelhead trout		101,400		101,400
Sultan, Wash.: [a] Entire year	Chinook salmon		40,290		40,290
	Silver salmon		3,012,500		3,012,500
	Steelhead trout		292,425		292,425
Battery, Md.: Mar.-May	Alewife		4,851,000		4,851,000
	Shad		2,241,000		2,241,000
	White perch	17,850,000	157,480,000		175,330,000
	Yellow perch	19,000,000	41.825,000		60,825,000
Boothbay Harbor, Me.: Entire year	Cod		21,841,000		21,841,000
	Flatfish		394,499,000		394,499,000
	Haddock		974,000		974,000
	Lobster		193,800,000	6,200	193,806,200
Bozeman, Mont.: [a] Entire year	Blackspotted trout		1,339,250	268,750	1,608,000
	Brook trout		370,000	350,925	920,925
	Grayling	350,000	1,780,000		2,130,000
	Lake trout			9,500	9,500
	Landlocked salmon			7,000	7,000
	Rainbow trout	75,000	110,000	199,000	384,000
	Steelhead trout		6,000	16,500	22,500
Yellowstone, Wyo.: [a] July-Aug	Blackspotted trout	3,435,000	560,000		3,995,000
Bryans Point, Md.: [a] Mar.-May	Shad		13,899,000		13,899,000
	Yellow perch		151,592,000		151,592,000
Cape Vincent, N. Y.: Entire year	Brook trout		805,000		805,000
	Lake herring		79,200,000		79,200,000
	Lake trout		5,125.000		5,125,000
	Pike perch		38,400,000		38,400,000
	Whitefish		18,000,000		18,000,000
Central Station, Washington, D. C.: Entire year	Pike perch		2,600,000		2,600,000
	Shad		500,000		500,000
	Yellow perch		100,000		100,000
Clackamas, Oreg.: Entire year	Blackspotted trout			187,100	187,100
	Brook trout			99,829	99,829
	Chinook salmon	12,000	4,209,170	2,681,255	6,902,425
	Lake trout			24,871	24.871
	Rainbow trout			23,000	23,000
	Silver salmon		20,000		20,000
	Steelhead trout			98,579	98,579

[a] For convenience in handling, transfers were made as follows:
Brinnon to Quilcene, 4,000,000; to Duckabush, 4,550,000 dog salmon eggs; to Duckabush, 151,000; to Quilcene, 35,000 steelhead trout eggs.
Day Creek to Birdsview, 47,500 steelhead trout eggs.
Illabott Creek to Birdsview, 100,000 silver salmon eggs.
Sultan to Birdsview, 50,000 chinook salmon eggs.
Bozeman to Northville, 50,000; to Leadville, 50,000 grayling eggs.
Yellowstone to Leadville, 4,039,000; to Bozeman, 1,866,000; to Clackamas, 200,000; to Spearfish, 1,944,000 blackspotted trout eggs.
Bryans Point to Central Station, 1,560,000 yellow perch eggs; 688,000 shad eggs.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1915—Contd.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Clackamas, Oreg.—Contd.					
Applegate, Oreg.:					
Entire year	Chinook salmon			330,000	330,000
	Silver salmon			2,115,000	2,115,000
	Steelhead trout	634,000	3,000	2,495,770	3,132,770
Big White Salmon, Wash.:					
Entire year	Chinook salmon		14,817,140	566,727	15,383,867
Illinois River, Oreg.:					
Mar	Chinook salmon		505,676		505,676
	Silver salmon		211,359		211,359
Little White Salmon, Wash.:					
Entire year	Chinook salmon		18,260,000	3,911,963	22,171,963
Rogue River, Oreg.:					
Entire year	Blackspotted trout		40,000	467	40,467
	Chinook salmon		1,419,500	1,164,902	2,584,403
	Steelhead trout		259,990	369,036	629,026
Willamette River, Oreg.:					
July–June	Shad		6,379,595		6,379,595
Cold Springs, Ga.:					
Entire year	Black bass		7,000	111,145	118,145
	Catfish			4,335	4,335
	Sunfish			49,035	49,035
Craig Brook, Me.:					
Entire year	Atlantic salmon		1,804,313		1,804,313
	Brook trout		173,408		173,408
	Humpback salmon		2,676,000	336,600	3,012,600
	Scotch sea trout		58,430		58,430
Duluth, Minn.: [a]					
Entire year	Brook trout			423,000	423,000
	Lake herring		9,750,000		9,750,000
	Lake trout	350,000	11,725,000	2,990,000	15,065,000
	Landlocked salmon			23,500	23,500
	Pike perch		7,450,000		7,450,000
	Steelhead trout			48,500	48,500
	Whitefish		16,400,000		16,400,000
Edenton, N. C.:					
Entire year	Black bass		21,000	95,950	116,950
	Shad		22,990,000		22,990,000
	Sunfish			23,750	23,750
	White perch		4,500,000		4,500,000
Weldon, N. C.:					
Apr.-May	Striped bass		8,594,500		8,594,500
Erwin, Tenn.: [a]					
Entire year	Black bass		1,300	1,200	2,500
	Brook trout			245,250	245,250
	Carp			297	297
	Rainbow trout			680,000	680,000
	Rock bass			14,153	14,153
	Smallmouth black bass.		400	3,150	3,550
	Sunfish			21,400	21,400
	Yellow sucker			200	200
Gloucester, Mass.:					
Entire year	Cod		70,280,000		70,280,000
	Flatfish		121,090,000		121,090,000
	Haddock		25,840,000		25,840,000
	Lobster		870,000		870,000
	Mackerel		170,000		170,000
	Pollock		500,730,000		500,730,000
Green Lake, Me.:					
Entire year	Brook trout		1,338,155		1,338,155
	Humpback salmon		1,929,000	23,157	1,952,157
	Lake trout		95,223		95,223
	Landlocked salmon		180,000	20,282	200,282
	Smelt	14,500,000	6,900,000		21,400,000
Grand Lake Stream, Me.: [a]					
Entire year	Landlocked salmon	291,000	117,042	73,358	481,400
Homer, Minn.:					
Entire year	Black bass			9,321	9,321
	Buffalofish			15	15
	Carp			6,501	6,501
	Catfish			77,692	77,692
	Crappie			349,094	349,094

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[a] For convenience in handling, transfers were made as follows:
Duluth to Holden, 50,000; to Green Lake, 100,000 lake trout eggs;
Erwin to Cold Springs, 195 carp; to Wytheville, 4,000 rock bass; 1,300 sunfish, all fingerlings.
Grand Lake Stream to Northville, 10,000; to St. Johnsbury, 15,000; to Nashua, 15,000; to Duluth, 25,000; to Green Lake, 44,350 landlocked salmon eggs.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1915—Contd.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Homer, Minn.—Continued. **Entire year**	Pike			5,376	5,376
	Pike perch		2,700,000	383	2,700,383
	Smallmouth black bass.			590	590
	Sunfish			576,465	576,465
	White bass			1,500	1,500
	Yellow perch		250,000	35,512	285,512
La Crosse, Wis.: **Entire year**	Black bass			14,290	14,290
	Brook trout			73,000	73,000
	Buffalofish			21,500	21,500
	Carp			565,000	565,000
	Catfish			731,000	731,000
	Crappie			664,050	664,050
	Pike and pickerel			79,500	79,500
	Pike perch		2,500,000		2,500,000
	Rainbow trout			89,000	89,000
	Sunfish			798,600	798,600
	Yellow perch			1,000	1,000
Leadville, Colo.: [a] **Entire year**	Blackspotted trout			3,484,000	3,484,000
	Brook trout	350,000	1,044,000	2,367,500	3,761,500
	Grayling		48,000		48,000
	Rainbow trout			367,700	367,700
Louisville, Ky.: **Entire year**	Black bass			3,040	3,040
	Sunfish			1,550	1,550
Mammoth Spring, Ark.: [a] **Entire year**	Black bass		695,000	94,650	789,650
	Crappie			22,000	22,000
	Rock bass			355,820	355,820
	Smallmouth black bass.		399,000	43,088	442,088
	Sunfish		135,000		135,000
Friars Point, Miss.: [a] **July-Dec**	Black bass			10,636	10,636
	Catfish			4,221	4,221
	Crappie			1,108	1,108
	Rock bass			130	130
	Sunfish			11,530	11,530
Manchester, Iowa: [a] **Entire year**	Brook trout			1,080,295	1,080,295
	Lake trout			23	23
	Pike perch		3,520,000		3,520,000
	Rainbow trout	376,750		357,200	733,950
	Rock bass			3,715	3,715
	Smallmouth black bass.		3,500	3,795	7,295
	Sunfish			5,234	5,234
Bellevue, Iowa: [a] **Aug.-Dec.**	Black bass			49,930	49,930
	Buffalofish			44,500	44,500
	Carp			59,200	59,200
	Catfish			184,620	184,620
	Crappie			590,365	590,365
	Fresh-water drum			65	65
	Pike			1,870	1,870
	Sunfish			833,850	833,850
	White bass			1,285	1,285
	Yellow bass			25	25
	Yellow perch			20,980	20,980
North McGregor, Iowa: [a] **Aug.-Dec**	Black bass			55,525	55,525
	Buffalofish			46,800	46,800
	Carp			8,300	8,300
	Catfish			600,800	600,800
	Crappie			123,450	123,450
	Pike			1,100	1,100
	Sunfish			328,940	328,940
	White bass			40	40
	Yellow perch			17,100	17,100

[a] For convenience in handling, transfers were made as follows:

Leadville to Wytheville, 200,000; to Clackamas, 100,000; to Manchester, 500,000 brook trout eggs.

Mammoth Springs to Quincy, 8,000; to Tupelo, 8,500; to Cold Springs, 5,500; to Friars Point, 500 rock bass fingerlings; to Tupelo, 100; to Quincy, 4,955 smallmouth bass.

Friars Point to Tupelo, 4,150 catfish; 106 black bass.

Manchester to Quincy, 4,440 sunfish; to Leadville, 454,000; to La Crosse, 100,500; to Clackamas, 120,000; to Northville, 105,000 rainbow trout eggs.

Bellevue to Cold Springs, 2,950 crappie.

North McGregor to Cold Springs, 4.375 black bass; 600 sunfish.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1915—Contd.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Nashua, N. H.:					
Entire year	Brook trout	1,750	440,000	7,600	449,350
	Landlocked salmon		12,000	2,430	14,430
	Rainbow trout		10,000	19,000	29,000
	Smallmouth black bass.		47,120	80	47,200
Neosho, Mo.: [a]					
Entire year	Black bass			18,180	18,180
	Brook trout			892	892
	Crappie			3,820	3,820
	Rainbow trout			102,398	102,398
	Rock bass			27,625	27,625
	Smallmouth black bass.			780	780
	Sunfish			22,707	22,707
Northville, Mich.: [a]					
Entire year	Brook trout		755,000	76,000	831,000
	Grayling		45,000		45,000
	Lake trout	12,500,000			12,500,000
	Landlocked salmon		4,000		4,000
	Rainbow trout		85,450	12,400	97,850
	Smallmouth black bass.		11,900	25,710	37,610
Alpena, Mich.:					
Apr.-May	Lake trout		3,500,000		3,500,000
	Whitefish		32,000,000		32,000,000
Charlevoix, Mich.:					
Mar.-Apr	Lake trout		11,000,000		11,000,000
	Whitefish		30,000,000		30,000,000
Detroit, Mich.: [a]					
Apr.-May	Pike perch	26,400,000	12,550,000		38,950,000
	Whitefish	6,000,000	70,000,000		76,000,000
Sault Ste. Marie, Mich.:					
Apr.-May	Lake trout		3,500,000		3,500,000
	Whitefish		30,000,000		30,000,000
Put-in Bay, Ohio: [a]					
Entire year	Lake herring		3,400,000		3,400,000
	Lake trout		350,000		350,000
	Pike perch	284,450,000	56,400,000		340,850,000
	Whitefish	92,900,000	209,000,000		301,900,000
Quinault, Wash.:					
Entire year	Blueback salmon		3,558,591		3,558,591
	Chinook salmon		19,913		19,913
	Silver salmon		198,966		198,966
	Steelhead trout		10,598		10,598
Quincy, Ill.: [a]					
Entire year	Black bass			149,665	149,665
	Buffalofish			2,034	2,034
	Carp			5,113	5,113
	Catfish			64,400	64,400
	Crappie			29,660	29,660
	Pike perch		3,100,000		3,100,000
	Rock bass			25	25
	Strawberry bass			470	470
	Sunfish			22,250	22,250
	Yellow bass			395	395
	Yellow perch			7,905	7,905
St. Johnsbury, Vt.: [a]					
Entire year	Brook trout	155,400	373,500	610,046	1,138,946
	Lake trout			31,500	31,500
	Landlocked salmon			2,040	2,040
	Rainbow trout		12,000	9,500	21,500
	Smallmouth black bass.		30,000	1,898	31,898
	Steelhead trout			36,360	36,360
	Yellow perch			22,500	22,500

[a] For convenience in handling, transfers were made as follows:

Neosho to Quincy, 12,350 sunfish; 24,300 rock bass; 1,350 smallmouth bass; to Erwin, 249,350 rainbow trout eggs.

Northville to Duluth, 6,932,000; to Cape Vincent, 7,512,000; to Put-in Bay, 1,920,000; to Sault Ste. Marie, 3,500,000; to Alpena, 3,500,000; to Charlevoix, 11,000,000 lake trout eggs.

Detroit to Sault Ste. Marie, 30,000,000; to Alpena, 32,000,000; to Charlevoix, 30,000,000 whitefish eggs; to Duluth, 20,000,000 pike perch eggs.

Put-in Bay to Duluth, 25,000,000; to Detroit, 117,800,000 whitefish eggs; to Manchester, 3,000,000; to Wytheville, 3,000,000; to Quincy, 5,000,000; to Homer, 5,000,000; to La Crosse, 5,000,000 pike perch eggs.

Quincy to Tupelo, 3,000 yellow perch; to Neosho, 1,200 catfish; to Leadville, 210; to Bozeman, 240 black bass; to White Sulphur, 150 black bass; 660 crappie, 18 carp, 150 yellow perch fingerlings.

St. Johnsbury to La Crosse, 100,000 brook trout eggs; to Holden, 32,000 steelhead trout eggs.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1915—Contd.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
St. Johnsbury, Vt.—Contd.					
Holden, Vt.:					
Entire year	Brook trout		408,000	2,265	410,265
	Lake trout			201,796	201,796
	Landlocked salmon			11,940	11,940
	Steelhead trout		15,000	44,750	59,750
Swanton, Vt.:					
Apr.-May	Pike perch	15,500,000	151,200,000		166,700,000
	Yellow perch		1,500,000		1,500,000
San Marcos, Tex.:					
Entire year	Black bass		5,000	446,657	451,657
	Catfish			25	25
	Crappie			20,425	20,425
	Rock bass			3,635	3,635
	Sunfish			19,680	19,680
Spearfish, S. Dak.:					
Entire year	Blackspotted trout			853,650	853,650
	Brook trout			983,000	983,000
	Lake trout			18,680	18,680
	Loch Leven trout			48,000	48,000
	Rainbow trout			16,350	16,350
Tupelo, Miss.:					
Entire year	Black bass			330,965	330,965
	Sunfish			84,700	84,700
White Sulphur Springs, W. Va.:					
Entire year	Black bass			12,000	12,000
	Brook trout			441,900	441,900
	Rainbow trout			90,600	90,600
	Smallmouth black bass.		162,000	1,100	163,100
Woods Hole, Mass.:[a]					
Entire year	Cod		168,012,000		168,012,000
	Flatfish		778,567,000		778,567,000
	Mackerel		4,677,000		4,677,000
	Tautog		606,000		606,000
Wytheville, Va.:[a]					
Entire year	Black bass		29,000	41,950	70,950
	Brook trout			24,715	24,715
	Pike perch		2,700,000		2,700,000
	Rainbow trout	474,000		196,915	670,915
	Rock bass			15,200	15,200
	Smallmouth black bass.		27,500	3,110	30,610
	Sunfish			2,250	2,250
Yes Bay, Alaska:[a]					
Entire year	Blueback salmon	3,000,000	32,029,000	3,175,000	38,195,000
Total		536,260,143	3,694,621,249	58,300,501	4,289,181,893
Loss in transit			339,550	84,539	424,089
Net		536,260,143	3,694.281,699	58,215,962	4,288,757,804

[a] For convenience in handling, transfers were made as follows:
Woods Hole to Gloucester, 24,630,000 cod eggs.
Wytheville to White Sulphur, 6,000 rainbow trout fingerlings; to St. Johnsbury, 50,000; to Nashua, 150,000; to Erwin, 400,000; to White Sulphur, 214,000 rainbow trout eggs; to Cold Springs, 3,600 rock bass fingerlings.
Yes Bay to Birdsview, 2,000,000 humpback salmon eggs.

The eggs hatched at the main stations listed in the foregoing table are in many cases obtained from auxiliary sources, usually temporary stations occupied during the season only, or, in some instances, mere camps which are shifted from year to year. In the Great Lakes and off the New England coast collections are made by the Bureau's vessels or boats in favorable localities. The following temporary stations and collecting points furnished eggs of the given species for the main hatcheries during 1915:

LIST OF EGG-COLLECTING STATIONS, FISCAL YEAR 1915.

Station.	Period of operation.	Species handled.
Alaska:		
Eagle Lake	June	Blueback salmon.
Ketchikan Creek	September, October	Humpback salmon.
Seal Harbor	June and October	Blueback salmon.
Colorado:		
Antero Reservoir	Apr. 11-May 22	Rainbow trout.
Cheesman Lake	Apr. 17-May 15	Do.
Edith Lake	Oct. 16-Nov. 9	Brook trout.
Englebrecht Lake	Oct. 9-Nov. 21	Do.
Musgroves Lake	Oct. 23-Nov. 21	Do.
Smiths Ponds	Oct. 28-Nov. 25	Do.
Northfield Lakes	Oct. 18-Nov. 16	Do.
Stonewall Lake	Apr. 15-May 15	Rainbow trout.
Turquoise Lake	Oct. 27-Nov. 17	Brook trout.
Wellington Lake	Oct. 15-Nov. 10	Do.
Woodland Park Lake	Oct. 18-Nov. 16	Do.
Maine:		
Portland	July, October, May, June.	Lobster.
Massachusetts:		
Plymouth	Nov. 23-Jan. 11	Cod.
Waquoit	Jan. 1-Apr. 15	Flatfish.
Michigan:		
Bay City	Apr. 17-Apr. 28	Pike perch.
Bay Port	Nov. 9-Nov. 21	Whitefish.
Belle Isle	Oct. 25-Dec. 8	Do.
Charity Island	Oct. 14-Dec. 2	Do.
Detour	Oct. 18-Nov. 19	Lake trout.
Fairport	Oct. 29-Nov. 16	Do.
Frankfort	Nov. 3-Nov. 14	Do.
Isle Royale	Sept. 23-Nov. 21	Lake trout and whitefish.
Keweenaw Point	Oct. 4-Nov. 1	Lake trout.
Manistique	Oct. 29-Nov. 25	Do.
Marquette	Oct. 14-Dec. 2	Lake trout and lake herring.
Monroe	Nov. 5-Dec. 10	Whitefish.
Munising	Oct. 14-Nov. 10	Lake trout.
Naubinway	Nov. 16-Dec. 2	Whitefish.
Ontonagon	Oct. 17-Nov. 9	Lake trout.
St. James	Oct. 29-Dec. 18	Lake trout and whitefish.
Minnesota:		
Grand Marais	Oct. 1-Dec. 3	Lake trout and lake herring.
Montana:		
O'Dell Creek	Mar. 22-May 4	Grayling.
South Meadow Creek	Mar. 22-May 1	Grayling and rainbow trout.
New York:		
Amherst Island	Oct. 25-Nov. 1	Lake trout.
Charity Shoals	Oct. 22-Nov. 7	Do.
Horseshoe Island	Oct. 20-Nov. 1	Do.
Ogdensburg	Apr. 15-May 3	Pike perch.
Old Forge	Nov. 12-Nov. 25	Whitefish.
Pigeon Island	Oct. 25-Nov. 1	Lake trout.
Pope Mills	Apr. 10-Apr. 12	Pike perch.
Sodus Point	Nov. 28-Dec. 12	Lake herring.
Stony Island	Nov. 6-Nov. 10	Lake trout.
Three Mile Bay	Nov. 9-Dec. 4	Lake herring and whitefish.
Ohio:		
Cleveland	Nov. 29-Dec. 6	Lake herring.
Kellys Island	Nov. 14-Dec. 8	Whitefish.
Middle Bass	Nov. 14-Dec. 6	Do.
North Bass	Apr. 15-Apr. 27, Nov. 10-Dec. 8.	Whitefish and pike perch.
Port Clinton	Apr. 9-Apr. 30, Nov. 14-Dec. 9.	Do.
Toledo	Apr. 8-Apr. 28, Nov. 14-Dec. 9.	Do.
Rhode Island:		
Wickford	Feb. 26-Apr. 5	Flatfish.
South Dakota:		
La Plant Lake	Oct. 15-Jan. 15	Brook and Loch Leven trout.
Schmidts Lakes	Oct. 20-Dec. 25	Brook trout.
Vermont:		
Darling Pond	July 21-Dec. 29	Do.
Lake Mitchell	July 1-Dec. 18	Do.
Orleans	Apr. 15-June 30	Steelhead trout.
Speedwell Pond	Oct. 21-Nov. 3	Brook trout.
Wyoming:		
Clear Creek	July 1-July 21, June 1-June 30.	Blackspotted trout.
Columbine Creek	July 1-July 16, June 14-June 30.	Do.
Cub Creek	July 1-July 21, June 4-June 30.	Do.
Lake Camp	July 1-Sept. 10, May 21-June 30.	Do.
Pelican Creek	July 1-July 25, May 21-June 30.	Do.

DETAILS OF DISTRIBUTION OF FISH AND EGGS DURING THE FISCAL YEAR 1915.

CATFISH.

Disposition.	Fingerlings, yearlings, and adults.
Alabama:	
Clayton, Kennedy's pond	60
Evergreen, Hunter Mill Pond	175
Fort Deposit, Barganier's pond	65
Golson's pond	65
McCrory's pond	65
Littleton, Robbins's pond	100
Livingston, Gould's pond	125
Marion Junction, Donald's pond	125
Neenah, Harper's pond	125
Perdido, Havard's pond	125
Russellville, Douglas's pond	100
Scottsboro, Coulson's pond	200
Tumlin, Cold Spring Pond	100
Arizona:	
Benson, Parker's pond	200
Clifton, Rattlesnake Pond	200
Courtland, Elliott's pond	400
Douglas, Fountain Pond	200
Schweichler's pond	400
Fairbank, Jo Ranch pond	200
Grand Canyon, Reed's lake	125
Pearce, Five D Reservoir	200
Sunny Slope Pond	200
Safford, Smithson's pond	200
Thatcher, Bigler's pond	200
Tucson, Huebabi Pond	200
Peach Orchard Lake	200
Willow Pond	200
Yerba Buena Pond	200
Wilcox, Daurety's pond	200
Grant Creek Pond	200
McComb's pond	200
Smith Pond	200
Sunny Slope Pond	200
Yuma, Colorado River	1,200
Arkansas:	
Big Hill, King's pond	100
Colorado:	
Florence, Sanders's lake	250
Georgia:	
Austell, Sweetwater Creek	300
Brooklyn, Armor's pond	50
Broxton, Byrd's pond	100
Bullochville, Allen's pond	60
Butts's pond	150
Carrolton, Little Tallapoosa River	200
Clarksville, Nichols's pond	100
Collins, Pond Creek	100
Comer, Porterfield's pond	100
Cornelia, Carter's pond	100
Walker's pond	100
Covington, Yellow River	150
Crawfordville, Chapman Creek	100
Culverton, Waller's pond	50
Cusseta, Big Spring Pond	100
Good Hope, East Lake	100
Harlem, Blanchard's ponds	500
Lovejoy, Pritchett's pond	125
Meansville, Franklin's pond	250
Moreland, Flower Lake	150
Shady Lake	150
Newman, McClendon's pond	50
Raymond, Maple Lake	200
Red Oak, Kite's pond	100
Rupert, Cooper's pond	150
Williamson's pond	50
Senoia, White Oak Pond	100
Sharpsburg, North's pond	50
Pittman's pond	50
Shiloh, Ingram's pond	50
Temple, Baker's pond	100
Wester Club Pond	100
Georgia—Continued.	
Thomaston, Grist Mill Pond	125
Zorn's pond	125
Thomson, Sweetwater Pond	50
Illinois:	
Benton, Andys Creek	600
Carbondale, Crain's lake	1,000
Coal Valley, Bolman's pond	125
Dix, Hay's pond	300
Dow, Brick Yard Pond	300
Freeport, Yellow Creek	9,000
McClusky, Shady Lake	800
Meredosia, Meredosia Bay	1,000
Nokomis, Walters's pond	300
Quincy, Illinois River	20,000
Savanna, Sand Slough	2,000
West Point, Gordon's pond	300
Indiana:	
Borden, Crystal Spring Pond	150
Koeter's pond	150
Corydon, Haub's pond	150
English, Hogs Defeat Creek	300
Sunman, Fritsch Pond	200
Union Center, Hildebrand Creek	125
Iowa:	
Bellevue, Mississippi River	174,475
Hamilton, Meadow Pond	125
Iowa Falls, Iowa River	3,000
Manchester, Maquoketa River	20
Monteith, Couch's pond	200
North McGregor, Mississippi River	593,000
Kansas:	
Lancaster, Twin Ponds	250
Oakley, Rector's pond	250
Scott, Sickle's pond	250
Kentucky:	
Campbellsburg, Bell's pond	150
Early Times, Strawberry Pond	150
Eminence, Banta's pond	125
Franklin, Baird's pond	200
Brizendine's pond	200
Huffhine's pond	200
McFarlin's pond	200
Sulphur Spring Creek	200
Woodland Pond	200
Glasgow, Beaver Creek	450
La Grange, Riley's pond	125
Lebanon, McElroy's ponds	300
Lexington, Lake Ellerslie	250
Louisville, Riebel's pond	125
Morehead, Gayheart's pond	300
Morgan, Gum Lick Pond	100
Paintsville, Big Sandy River, Levissa Fork	300
Richmond, Lily Pond	100
St. Marys, Elder's pond	150
Smock's pond	150
Stanford, Dix River	200
Walton, Glinn's pond	150
Louisiana:	
Cecil, Mineral Pond	50
Dodson, Stovall's pond	300
Jonesboro, Walkers's ponds	200
Lake Charles, Nice's pond	105
Pelican, Magee's pond	100
Maryland:	
Buena Vista, Lake Royer	600
Taneytown, Goulden's pond	600
Michigan:	
Wetmore, Mud Lake	500
Minnesota:	
Brainerd, Mississippi River	500
Homer, Mississippi River	74,817

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

CATFISH—Continued.

Disposition.	Finger-lings, yearlings, and adults.
Mississippi:	
Blue Mountain, Lake of the Pines	150
Friars Point, Mississippi River	51
Gloster, Brown's pond	100
Parker's pond	100
Ratcliff's ponds	250
Horn Lake, Wheat's pond	50
Meridian, Thomas's pond	200
Pontotoc, Elm Pond	100
Saltillo, Shady Lake	75
Turnbull, Stockett's pond	100
West Point, Hamlin's pond	100
Lloyd's pond	100
Westbrook's pond	100
Whitaker, Wall's pond	100
Winona, Cameron's pond	100
Erwin's pond	100
Woodville, Sessions's pond	100
Missouri:	
Birch Tree, Meredith's pond	100
Carthage, Week's pond	100
Ferguson, Club Lake	2,400
Marceline, Club Lake	250
Milo, Roberts's pond	100
Montana:	
Glendive, Yellowstone River	500
New Jersey:	
Clementon, Bedford Mission Pond	300
South Plainfield, Willow Lake	300
New Mexico:	
Albuquerque, Ames's pond	200
Armijo Lake	400
Ancho, Cooper's pond	200
Artesia, Gage's pond	125
Buchanan, De Graftenreid's pond	125
Clovis, Pleasant Hill Pond	250
Westfall's pond	250
Deming, Chandler's pond	200
Crystal Lake	200
Lindauer's pond	200
Elida, Cryer's pond	375
Spillman's pond	375
Hagerman, McCormick's pond	125
Kenna, Chavess's pond	125
Melrose, Huntzinger's pond	125
Toole's pond	125
Montoya, Dismuke's pond	200
Nara Visa, Agvacaballa Creek	200
Portales, Felond's pond	375
Toliver's pond	375
Pyote, Jal Pond	125
Rodeo, McCant's pond	200
Sante Fe, Ayers's pond	200
Moe's pond	200
Tucumcari, Goldenberg's pond	200
Sisney's lake	400
New York:	
Addison, Canisteo River	300
Deansboro, Brook's pond	100
Pine Bush, Dwaarkill River	200
Schenevus, Schenevus Creek	200
Walden, Wallkill River	200
North Carolina:	
Spring Hope, Perry's pond	150
North Dakota:	
Dawson, Dawson Ice Pond	100
Sentinel Butte, Andrews Creek	100
Kitchen's pond	100
Ohio:	
Adair Station, Scott Pond	100
Barberton, Camp's pond	100
Berea, Lake Abram	100
Columbus, Olentangy River	100
Mansfield, Gatten's lake	100
Woodstock, Darby Creek	375
Oklahoma:	
Bessie, Reasch's pond	125
Brinkman, Lake George	250
Oklahoma—Continued.	
Camargo, Butler Lake	250
Cashton, Opal Lake	100
Cherokee, Box Alder Lake	125
Brewster's pond	125
Coweta, Egan's pond	100
Custer, Hays's pond	125
Devol, Devol Pond	500
Drummond, Farber's pond	125
Loch Lomond Pond	125
Elgin, Leach's pond	100
Fletcher, Shady Lake	100
Frederick, Whatley Pond	250
Granite, Mountain Pond	250
Guthrie, Huston's pond	100
Hastings, Whitcomb's pond	100
Lawton, Landoll's lake	200
Lebrecht's pond	100
Twin Springs Pond	100
Lone Wolf, Sunnybrook Pond	250
Manitou, Moose Head Lake	250
Marshall, Anter Creek	300
May, Crystal Lake	250
West Otter Creek	250
Medford, Evans's pond	250
Ewing's pond	250
Mill Creek, Brewer's pond	200
Mooreland, Barrick's pond	250
Okarche, Thelens Pond	250
Oklahoma City, Teal Duck Lake	200
Perry, Harkins's pond	200
Prague, Zatloukal's pond	100
Purcell, Gault's pond	100
Quinlan, Moseley's pond	250
Sentinel, Patton's pond	500
Tecumseh, Clark's pond	100
Texhoma, Beaver Pond	200
Vici, South Persimmon Creek	250
Watonga, Jamison's pond	250
Wellston, Pleasant Pond	100
Pennsylvania:	
Hazleton, Keller Pond	300
Honesdale, Beach Lake	200
Bunnell Pond	400
Cajon Lake	200
Jonestown, Swatara Creek	600
Lake Carey, Lake Carey	200
Lebanon, Big Swatara Creek	600
Pequea, Susquehanna River	200
Reading, Bieber Creek	600
Spring City, Elliott Pond	200
French Creek	400
Mill Creek	200
Schuylkill River	200
Telford, Branch Creek	200
Woodbine, Grove's pond	600
York, Caddoms Creek, West Branch	600
Porto Rico:	
San Juan, Comerio Lake	600
South Carolina:	
Belton, Kay's pond	100
Wilson's pond	100
Selvern, Brogden's pond	100
Wagener, Buzbee's pond	100
South Dakota:	
Capa, Big Prairie Dog Creek	100
Dallas, Stumer's pond	150
Draper, Inglenook Pond	100
Edgemont, Lake Calvert	425
Fairfax, Thielfoldt's pond	150
Faith, Sweet's pond	150
Forestburg, Tlustos's pond	100
Ipswich, Linden Lake	100
McIntosh, Stink Creek	100
Murdo, Murdo Pond	200
Oacoma, Broken Diamond Lake	100
Oelrichs, Black Bank Creek	100
Horsehead Creek	300

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

CATFISH—Continued.

Disposition.	Fingerlings, yearlings, and adults.
South Dakota—Continued.	
Parkaton, Mogck Lake	100
Pierre, Currie's pond	200
Dean's pond	200
Patrick's pond	100
Rapid City, Mallow's pond	100
Tennessee:	
Adams, Willow Pond	140
Belvidere, Long Pond	100
Woods Pond	200
Brush Creek, Lawrence's pond	140
Cowan, Moore's pond	140
Estill Springs, Lye Pond	140
Fayetteville, Stone's pond	100
Franklin, Hill Valley Pond	100
Friendsville, Anderson's pond	100
Greenback, Baker Creek	300
Petty's pond	200
Kiser, Brient's pond	100
Morrison, Bonner Pond	200
Parker Spring Lake	100
Newbern, Wild Rose Pond	60
Oneida, Williams Creek, East Fork	200
Portland, Perdue's pond	140
Sparta, Calfkiller River	200
Cherry Creek	100
Officer's pond	100
Snodgras's pond	100
Swindell's pond	100
Texas:	
Coupland, Nelson's pond	25
Vermont:	
West Danville, Cole Pond	400
Mollys Pond	400
Virginia:	
Balcony Falls, Engleman's pond	100
Charlottesville, Browning's pond	200
Harrisonburg, Muddy Creek	200
Shenandoah River	500
Tye River, Big Piney River	300
West Virginia:	
Clay Run, Crouch's pond	200
Colcord, Orchard Pond	100
Inwood, Shipper's pond	100
Weston, Monongahela River, West Fork	400
Wisconsin:	
Birchwood, Birch Lake	600
Lake Chetac	800
Fall Creek, Fall Creek	400
Greenwood, Black River	375
Hawkins, Goose Neck Lake	200
Shamrock Lake	300
Ingram, Lake Shamrock	300
Mud Lake	300
Skinner Creek, South Fork	300
La Crosse, Mississippi River	210,000
Lynxville, Mississippi River	510,000
Monticello, Little Sugar River, North Branch	600
Monticello, Little Sugar River, West Branch	600
Rice Lake, Hemlock Lake	800
Wyoming:	
Gillette, Burlington Pond	450
Lusk, Hat Creek	425
Verona, Green's pond	150
Total[a]	1,665,793

[a] Lost in transit, 800.

CARP.

Alabama:	
Goodwater, Catching's pond	36
Roanoke, Boaten Pond	44
Tumlin Gap, Burnett Lake	36
Connecticut:	
Greenwich, Horseneck Pond	100
Westboro, Nichols's pond	100
Florida:	
Marianna, Davis's pond	36
Georgia:	
Norwood, Bradshaw's pond	45
Illinois:	
Meredosia, Meredosia Bay	10
Quincy, Illinois River	5,000
Iowa:	
Bellevue, Mississippi River	59,000
North McGregor, Mississippi River	8,200
Kentucky:	
Midway, Elmwood Lake	10
Minnesota:	
Homer, Mississippi River	6,501
New Jersey:	
Red Bank, Ramenessin Farm Pond	100
South Carolina:	
Laurens, Saxton Ponds	100
Virginia:	
Chatham, Carter's pond	18
Granite, Pond "B"	75
Wisconsin:	
La Crosse, Mississippi River	65,000
Lynxville, Mississippi River	500,000
Total	644,411

YELLOW SUCKER.

Disposition.	Adults.
Virginia:	
Mount Crawford, North River	200

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

BUFFALOFISH.

Disposition.	Fingerlings, yearlings, and adults.	Disposition.	Fingerlings, yearlings, and adults.
Georgia:		Minnesota:	
Griffin, Lucia Pond	100	Homer, Mississippi River	15
Illinois:		Wisconsin:	
North Henderson, Lily Pond	24	La Crosse, Mississippi River	16,500
Meredosia, Meredosia Bay	10	Lynxville, Mississippi River	5,000
Quincy, Illinois River	2,000		
Iowa:		Total	114,849
Bellevue, Mississippi River	44,500		
North McGregor, Mississippi River	46,700		

FRESH-WATER DRUM.

Disposition.	Fingerlings.
Iowa:	
Bellevue, Mississippi River	65

SHAD.

Disposition.	Fry.	Disposition.	Fry.
Georgia:		North Carolina—Continued.	
Athens, Oconee River	720,000	Newbern, Neuse River	1,000,000
Fairfax, Satilla River	750,000	Washington, Pamlico River	1,163,000
Maryland:		Wilmington, Black River	300,000
Battery, Chesapeake Bay	1,266,000	Cape Fear River	1,200,000
Broad Creek, Potomac River	1,258,000	North East River	300,000
Havre de Grace, Furnace Creek	170,000	Oregon:	
Northeast River	365,000	Willamette, Willamette River	6,379,595
Swan Creek	160,000	South Carolina:	
Lakeland, Newmans Pond	2,500,000	Florence, Jeffrey Creek	1,000,000
Locust Point, Chesapeake Bay	280,000	Virginia:	
Piscataway Creek, Potomac River	1,826,000	Dogue Creek, Potomac River	2,487,000
Pomonkey Creek, Potomac River	755,000	Little Hunting Creek, Potomac River.	1,255,000
Swan Creek, Potomac River	929,000	Mount Vernon, Potomac River	592,000
North Carolina:		Occoquan Bay, Potomac River	2,797,000
Avoca, Chowan River	2,112,000		
Edenton, Albemarle Sound	10,567,000	Total	46,009,595
Edenton Bay	2,878,000		
Greenville, Tar River	1,000,000		

ALEWIFE.

Disposition.	Fry.
Maryland:	
Battery, Chesapeake Bay	4,851,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

WHITEFISH.

Disposition.	Eggs.	Fry.
Michigan:		
Antrim City, Lake Michigan		14,000,000
Belle Isle Park, Detroit River		53,500,000
Caseville, Saginaw Bay		3,000,000
Detour, Lake Huron		12,000,000
Escanaba, Lake Michigan		2,000,000
Fort Wayne, Detroit River		10,000,000
Grace Harbor, Lake Superior		4,800,000
Iron River, Sunset Lake		200,000
Manistee, Lake Michigan		3,000,000
Manistique, Lake Michigan		6,000,000
Marquette, Lake Superior		3,750,000
Monroe, Lake Erie		14,000,000
Naubinway, Lake Michigan		3,000,000
New Richmond, Lake Michigan		500,000
North Point, Lake Huron		19,000,000
Norway Reef, Lake Michigan		5,000,000
Sand Bay Island, Lake Michigan		11,000,000
Scare Crow Island, Lake Huron		13,000,000
Whitefish Bay, Lake Superior		2,000,000
Whitefish Point, Whitefish Bay		5,000,000
Minnesota:		
Duluth, Lake Superior		100,000
Grand Marais, Lake Superior		1,850,000
Susie Island, Lake Superior		2,100,000
Montana:		
Somers, State fish commission	1,000,000	
New York:		
Fox Island, Lake Ontario		3,750,000
Grenadier Island, Lake Ontario		4,000,000
Hayes Point, Lake Ontario		3,500,000
Long Lake West, Granpas Lake	200,000	
New York City, Aquarium	100,000	
Pleasant Lake, Pleasant Lake		500,000
Point Peninsula, Lake Ontario		3,500,000
Youngstown, Lake Ontario		1,000,000
Wilson Bay, Lake Ontario		1,750,000
Ohio:		
Catawba Island, Lake Erie		20,000,000
Isle St. George, Lake Erie		40,000,000
Kellys Island, Lake Erie		20,000,000
Marblehead, Lake Erie		20,000,000
Middle Bass, Lake Erie		30,000,000
Port Clinton, Lake Erie		20,000,000
Put-in Bay, Lake Erie		30,000,000
State fish commission	66,840,000	
Toledo, Lake Erie		15,000,000
Pennsylvania:		
Erie, State fish commission	24,560,000	
Philadelphia, Aquarium	200,000	
Wisconsin:		
Cornucopia, Lake Superior		3,600,000
Madison, State fish commission	6,000,000	
Total	98,900,000	405,400,000

LAKE HERRING (CISCO).

Disposition.	Fry.	Disposition.	Fry.
Michigan:		New York—Continued	
Escanaba, Green Bay	450,000	Stony Point, Lake Ontario	6,700,000
Minnesota:		Wayland, Loon Lake	1,000,000
Chester Creek, Lake Superior	4,050,000	Whitefish Bay, Chaumont Bay	3,000,000
Rochester, Lake Shady	450,000	Wilson Bay, Lake Ontario	3,500,000
New York:		Ohio:	
Cuba, Cuba Lake	1,000,000	Port Clinton, Lake Erie	3,400,000
Fox Island, Lake Ontario	18,500,000	Wisconsin:	
Grenadier Island, Lake Ontario	18,500,000	Superior Entry, Lake Superior	4,800,000
Hayes Point, Lake Ontario	13,500,000		
Point Peninsula, Lake Ontario	13,500,000	Total	92,350,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

SILVER SALMON.

Disposition.	Eggs.	Fry.	Fingerlings.
California:			
Baird, McCloud River			226,162
Battle Creek, Battle Creek		209,250	
Klamathon, Klamath River		462,490	
Sisson, State fish commission	1,913,280		
Michigan:			
Detroit, Detroit Aquarium	33,000		
New York:			
New York City, New York Aquarium	2,000		
Oregon:			
Applegate, Applegate Creek			2,115,000
Clackamas, Clackamas River		20,000	
Selma, Rancherie Creek		211,359	
Washington:			
Baker Lake, Baker Lake		2,514,000	
Birdsview, Grandy Creek		371,000	41,400
Skagit River		7,794,000	315,900
Brinnon, Hoods Canal		280,700	
Darrington, Sauk River		2,303,000	
Day Creek, Skagit River		2,130,095	
Duckabush, Duckabush River			37,000
Quilcene, Big Quilcene River		344,000	20,600
Little Quilcene River		46,000	
Quinault, Quinault Lake		198,966	
Rockport, Illabott Creek		1,278,950	
Skagit River		27,920	
Sultan, Elwell Creek		3,012,500	
Total	1,948,280	21,204,230	2,756,062

CHINOOK SALMON.

Disposition.	Eggs.	Fry.	Fingerlings.
California:			
Baird, McCloud River			2,875,544
Battle Creek, Battle Creek			5,001,345
Hornbrook, Klamath River	153,650		
Mill Creek, Mill Creek		3,740,400	
Sisson, State fish commission	34,301,073		
Tehama, Sacramento River		1,275,000	
Oregon:			
Applegate, Applegate Creek			330,000
Clackamas, Clackamas River		4,209,170	2,681,255
Rogue River, Elk Creek		1,118,500	115,000
Rogue River		301,000	1,049,902
Selma, Rancherie Creek		505,676	
Vermont:			
Lyndonville, Chrystal Lake	12,000		
Washington:			
Baker Lake, Baker Lake		116,000	
Big White Salmon, Big White Salmon River		2,812,140	460,000
Spring Creek		12,005,000	106,727
Birdsview, Grandy Creek			95,000
Skagit River			114,694
Day Creek, Skagit River		5,100	
Tingley Creek		35,818	
Illabott Creek, Illabott Creek		80,960	
Little White Salmon, Little White Salmon River		18,260,000	3,911,983
Quiniault, Quiniault Lake		19,913	
Rockport, Illabott Creek		3,965	
Skagit River		26,020	
Sultan, Elwell Creek		40,290	
Total	34,466,723	44,554,892	16,741,450

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BLUEBACK SALMON.

Disposition.	Eggs.	Fry.	Fingerlings.
Alaska:			
Afognak, Ahuyon Creek		16,000	
Letnik Lake		926,250	5,444,830
Yes Bay, McDonald Lake		19,360,000	3,175,000
Yes River		12,660,000	
Oregon:			
Bonneville, State fish commission	3,000,000		
Portland, Klamath Lake	100,000		
Washington:			
Baker Lake, Baker Lake		7,255,000	
Birdsview, Grandy Creek			46,425
Quiniault, Quiniault Lake		3,558,591	
Seattle, Applicant	5,000		
Startup, State fish commission	50,000		
Total	3,155,000	43,776,741	8,666,255

HUMPBACK SALMON.

Alaska:			
Afognak, Ahuyon Creek		141,000	
Letnik Lake		83,000	119,480
Maine:			
Bucksport, Harrimans Brook		400,000	
Calais, St. Croix River		300,000	
Cherryfield, Narraguagus River		100,000	
Columbus Falls, Pleasant River		450,000	8,000
Dennysville, Dennys River		450,000	7,157
East Machias, East Machias River		100,000	
East Orland, Alamoosook Lake		100,000	
Ellsworth, Branch Pond		45,000	
Patton Pond		45,000	
Union River		210,000	7,800
Harrington, Small Stream		100,000	
Orland, Orland River		1,376,000	336,600
Pembroke, Penmaquan River		63,000	
Penobscot, Pierce Brook		400,000	
Perry, Little River Perry		66,000	
South Penobscot, Wights Brook		400,000	
Washington:			
Birdsview, Grandy Creek		2,625,000	
Skagit River		2,125,000	
Duckabush, Duckabush River		1,820,000	
Quilcene, Big Quilcene River		309,800	
Little Quilcene River		49,700	
Total[a]		11,758,500	479,037

DOG SALMON.

Disposition.	Fry.
Washington:	
Birdsview, Skagit River	4,000
Brinnon, Hoods Canal	4,670,500
Walcots Slough	10,000
Darrington, Hatchery Creek	100,000
Sauk River	2,445,000
Day Creek, Skagit River	48,097
Duckabush, Duckabush River	14,465,000
Quilcene, Big Quilcene River	10,680,000
Little Quilcene River	930,000
Rockport, Illabott Creek	2,072,110
Skagit River	80,000
Total	35,504,707

[a] Lost in transit, 200 fingerlings.

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

STEELHEAD TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Minnesota:			
Caledonia, Badger Creek			2,000
Crooked Creek			2,000
Crooked Creek, South Fork			2,000
Crystal Valley Creek			2,000
Dexter Creek			2,000
East Beaver Creek			2,000
Irish Creek			1,000
Riceford Creek			2,000
Thompson Creek			2,000
West Beaver Creek			2,000
Wildcat Creek			2,000
Winnebago Creek			2,500
Glenwood, State fish commission	100,000		
Montana:			
Boyd, Frank's pond		6,000	
Red Lodge, Rainbow Lake			10,500
West Fork Lake			6,000
New Hampshire:			
Lake Tarlton, Lake Tarlton			8,500
New Jersey:			
Hackettstown, State fish commission	100,000		
New York:			
Au Sable Forks, Taylor Pond		12,000	4,500
Cambridge, Owl Kill Creek		3,000	
Ithaca, Cayuga Lake	4,000		
Raquette Lake, Uncas Lake	30,000		
Willsborough, Little Sky Pond			1,500
Warm Pond			3,000
Oregon:			
Applegate, Applegate Creek		3,000	2,494,270
Jackson Creek			1,500
Clackamas, Bear Creek			6,000
Clackamas River			24,000
Clear Creek			10,400
Clemens Creek			4,000
Eagle Creek			9,000
Fall Creek			1,500
Milk Creek			8,800
North Fork Creek			4,500
South Fork Creek			3,000
State fish commission			27,379
Trail, Crater Lake			30,000
Elk Creek		259,990	245,036
Rogue River			89,000
Union Creek			5,000
Vermont:			
Barton, Willoughby River			8,000
Bethel, Silver Lake			2,250
Chittenden, Chittenden Dam			5,500
Greensboro, Caspian Lake			5,750
Hardwick, East Long Pond			4,500
Joes Pond, Joes Pond			3,860
Middlebury, Lake Dunmore			5,000
Leicester River			2,000
Middlebury River			2,000
New Haven River			5,000
Ripton River			2,000
Sucker Brook			2,000
Orleans, Willoughby Lake			1,250
Willoughby River			8,000
Roxbury, State fish commission	200,000		
St. Johnsbury, Sleepers River			5,000
Washington:			
Bellingham, Lake Louise		8,000	
Silver Lake		10,000	
Birdsview, Grandy Creek			137,665
Skagit River		1,492,700	
Quilcene, Big Quilcene River		80,400	
Little Quilcene River		21,000	
Quinault, Quinault Lake		10,598	
Rockport, Illabott Creek		60,000	
Spokane, State fish commission	100,000		
Sultan, Elwell Creek		292,425	
Wisconsin:			
State Line, Black Oak Lake			9,500
Anderson Lake			4,500
Stone Lake, Stone Lake			10,000
Wyoming:			
Sheridan, State fish commission	109,000		
Total[a]	634,000	2,259,113	3,244,660

[a] Lost in transit, 2,500 fingerlings.

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

RAINBOW TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Alabama:			
Birmingham, Mountain Lake			4,000
Rockwood Springs Pond			1,000
Arizona:			
Clarksdale, Beaver Creek			1,000
Clear Creek			1,000
Oak Creek			1,000
Spring Creek			1,000
Sycamore Creek			1,000
Clifton, Casper's pond			500
Littlefield, Hancock Spring Creek			200
Safford, Deadman Creek			500
Simon, Jensen's pond			500
Arkansas:			
Gravette, White's pond			2,000
Hot Springs, Bayou Creek, East Fork			3,500
Gulpha Creek			433
Gulpha Creek, Middle Fork			9,900
Gulpha Creek, South Fork			4,000
Gulpha Creek, West Fork			500
Walnut Grove Pond			100
O'Neal, Martin Creek			4,950
Mill Creek			2,000
Siloam Springs, Flint Creek			2,500
Springdale, Mountain Home Pond			100
Sulphur Springs, Butler Creek			5,000
California:			
Colfax, Blair-Winchell Pond			200
Bolster's pond			200
Hornbrook, Cottonwood Creek		351,480	
Sisson, State fish commission	497,240		
Colorado:			
Antero, Antero Reservoir			25,200
Banard's ponds			1,000
Aroya, Wild Hose Pond			1,000
Aspen, Snow Mass Lake, Lower			5,000
Basalt, Frying Pan River			16,000
Biglow Spur, Frying Pan River			1,000
Buffalo, Rolling Creek			200
Wigwam Creek			200
Carbondale, Beaver Lake			1,000
Cassells, South Platte River, North Fork			10,000
Cebolla, Cebolla Creek			1,000
Gunnison River			1,000
Lower Gunnison River			1,000
Red Creek			1,000
Upper Cebolla Creek			2,000
Cliff, South Platte River			5,000
Clyde, Middle Beaver Creek			2,000
Coalmont, Katherine Lake			1,250
Colona, Beaton Creek Lake			1,000
Collins Lake			1,000
Cotopaxi, Hayden Creek			2,000
De Beque, Leon Creek			2,000
Libbey's pond			5,000
Mesa Lake			2,000
Dillon, Cocinera Lake			1,000
Edwards, Lake Creek			10,000
Empire, Clear Creek			400
Estabrook, Craigs Creek			4,000
Foxton, Platte River, North Fork			10,000
Platte River, South Fork			11,500
Fraser, Keyser Creek			2,000
Granby, Beaver Creek			2,000
Little Muddy Creek			2,000
Willow Creek			2,000
Granite, Twin Lakes			10,000
Grant, Geneva Creek			4,000
Gunnison, Gunnison River			1,000
Hopkins, Frying Pan River			2,000
Roaring Fork River			1,000
Idaho Springs, City Storage Lake			24,000
Loveland, Big Thompson River			10,000
Big Thompson River, Millers Fork			4,000
Big Thompson River, North Fork			10,000
Big Thompson River, Upper			10,000
Buckhorn River			10,000
Mack, Bitter Creek			2,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado—Continued.			
Marshall, South Boulder Creek			10,000
Minturn, Echo Lakes			6,000
Moffat, Saguache Creek			1,000
Nast, Chapman Creek			1,000
Frying Pan River			1,000
Ivanhoe Creek			1,000
Pine Grove, South Platte River			10,000
Pitkin, Lime Kiln Pond			1,000
Pueblo, Oak Lodge Trout Ponds			1,000
Rockwood, Lime Creek			2,000
Salida, Arkansas River			5,000
South Arkansas River			8,000
Sapinero, Currecanti Creek			1,000
Shawnee, South Platte River, North Fork			10,000
Singleton, South Platte River			22,300
Sloss, Frying Pan River			1,000
South Platte, South Platte River, South Fork			13,750
Trout Creek			18,000
Wigwam Creek			400
Steamboat Springs, Mary Lake			1,200
Meden Lake			2,000
Strontia Springs, Bear Gulch Creek			5,000
Westcliffe, Macey Lake			1,000
North Colony Creek			2,000
Woodland Park, Northfield Lake			8,000
West Creek			2,000
Connecticut:			
Newington, Abbott's pond			250
New London, Brandegee Aquarium			15
Ridgefield, Bonnie Loch Pond			1,000
Delaware:			
Newport, Justanna Pond			300
Georgia:			
Baldwin, Mountain Creek			4,000
Blue Ridge, Coopers Creek			8,000
Vestel Pond			2,000
Carrolton, Centralhatchie Creek			5,000
Chatsworth, Holly Creek			6,000
Clayton, Stecoa Creek			6,000
Cohutta, Williams Lake			2,000
Cornelia, Mountain Creek			4,000
Helen, Mitchell's lake			8,000
Rabun Gap, Betys Creek			4,000
Patterson Creek			4,000
Ramhurst, Arnett Creek			5,000
Tiger, Bee Branch Creek			4,000
Tiger Creek			5,000
Timson Creek			5,000
Idaho:			
Bliss, Buckeye Lake			2,000
Cambridge, Pine Creek			3,000
Deary, Drury's pond			2,000
Tetonia, Fall Creek			2,000
Spring Creek			4,000
Illinois:			
Galena, Burtons Branch			2,000
Indiana:			
Wellsboro, Markham Creek		3,000	
Iowa:			
Calmar, Otor Creek			3,000
Cedar Rapids (applicant)	2,000		
Decorah, Canoe Creek			3,000
Cold Water Creek			1,500
Trout River			2,000
Earlville, Elk Creek			3,000
Lansing, Riverside Trout Pond			2,400
Village Creek			1,000
Manchester, Maquoketa River			350
North McGregor, Bloody Run			6,000
Postville, Livingoog Spring Brook			250
Smiths Spring Brook			500
Stone House Brook			250
Yellow River			500
Yellow River, North Branch			500
Waucoma, Goddards Creek			1,500
Kentucky:			
Leitchfield, McClure's pond			600

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults
Maine:			
Bar Harbor, Jordan Pond			1,000
Benson Siding, Little Benson Lake			250
Boston Ranch, Special Pond			500
Mars Hill, Presque Isle Creek			250
Megantic, Arnold Pond			1,800
Portland, Duck Pond Brook			500
Sanford, Squaw Pond			500
Maryland:			
Baltimore, Beaver Dam Run			300
Brown, Turkey Branch			1,200
Empire, Folly Run			3,000
Fierys Siding, Marsh Run			1,500
Frostburg, Pioney River			5,000
Savage River			5,000
Glyndon, Old Mill Run			300
Hagerstown, Beaver Creek, Foltz Fork			3,000
Conococheague Creek, Manor Branch			1,000
Downsville Run			2,000
Marshalls Run			1,000
Troup Creek			2,000
Keedysville, Willow Branch Run			1,200
Lonaconing, Big Savage River			5,000
Oakland, Browning Pond			2,000
Ruxton, Callendar House Pond			300
Clear Pond			900
Sparks, Piney Run			900
Massachusetts:			
Athol, Lake Ellis			300
Dalton, Waconah Falls Creek			500
Windsor Creek			500
Forge Village, Forge Pond			500
Gardner, Ward Pond			4,000
Gloucester, Green's pond			200
Great Barrington, Green River			500
Konkapot River	25,000		
Hinsdale, Stevens Brook			500
Lancaster, Cumberry Pond			500
Little Pond			500
Spectacle Pond			500
Turner Pond		5,000	
Lee, Crosby Brook			250
Green Water Brook			250
Ward Pond			1,000
Lowell, Long Pond			250
Mansfield, Lake Neponset			500
Northampton, Long Plain Brook			7,000
Palmer, State fish commission	216,000		
Pittsfield, Pontoosuc Lake			2,680
Shelburne Falls, Bliss Pond			250
Branch Creek			1,000
Clessons River			250
Houton Brook			250
Waltham, Lake Walden			8,000
Westford, Long Sought For Pond			500
Michigan:			
Au Sable, Blue Joe Pond			1,200
Bailey, Crockery Creek		2,950	
Birmingham, Clizbe's pond			200
Buchanan, McCoys Creek			3,000
Sampson Creek			2,000
Charlevoix, Twin Lakes		4,000	
Clyde, Milford Lake		5,000	
Farwell, Tobacco River, Middle Fork			500
Grayling, Tillula Lake		3,000	
Greenville, Dixon Creek		4,000	
Hillman, Indian Creek			2,000
Holly, Thread River		5,000	
Midland, Chippewa River		5,000	
Pine River		5,000	
Montrose, Glenn Lake			500
Muskegon, Big Black Creek		3,000	
New Buffalo, Galion River		4,000	
Owasso, Willow Brook	25,000		
Petersburg, Crystal Pond			1,000
Ravenna, Crockery Creek			800
Green Creek			400
Rose Center, West Buckhorn Creek		1,500	
Six Lakes, Flat River			800
Traverse City, Boardman River, Lower		5,000	

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Minnesota:			
Chatfield, Jorden Creek			200
Randall Creek			200
Duluth, Evans Lake			1,000
Harmony, Big Spring Brook			200
Gregerson Creek			400
Jenkins, Pine River			3,000
Knife River, Manitou Creek			2,000
Nine Mile Creek			2,000
Little Falls, Platte River			2,000
Minneapolis, Nine Mile Creek			600
Nine Mile Creek, Left Branch			400
Purgatory Spring Brook			600
Plainview, Funcks Pond			200
Rochester, Spring Creek			2,000
Stockton, Ginthers Creek			5,000
Stockton Valley Creek			5,400
Stockton Valley Creek, South Branch			400
Missouri:			
Berwick, Clear Creek			2,000
Bourbon, Blue Spring Creek			2,000
Bunker, Black River, West Branch			2,000
Crane, Crane Creek			1,850
Exeter, Roaring River			6,775
Marshfield, James River			1,000
Neosho, Hickory Creek			455
Pultsight Spring Pond			1,000
Shoal Creek			2,400
Spring Lake			200
Newburg, Little Piney Creek			2,000
Mill Creek			5,947
Niagua, Davis Pond			300
Noel, Elk River			2,500
Rolla, Little Piney River			15,000
Springfield, Spring Lake			250
Stark City, Shannon Lake			100
Webb City, Center Creek			1,500
Montana:			
Bigtimber, Boulder River			2,500
Bozeman, Bridger Creek		5,000	
Carlin Creek		3,000	
Cockrell Creek		3,000	
Fish Creek		4,000	
Lansing Creek		5,000	
Mystic Lake		8,000	
Ole Olson Lake		8,000	
Clinton, Lily Pond			500
Columbus, Rosebud River, East and West		10,000	
Stillwater River		19,000	6,000
West Rosebud River		9,000	
Conrad, Lake View			3,000
Dell, Sage Creek			8,000
Dillon, Blacktail Deer Creek			3,000
Hedges, Careless Creek			3,000
Helena, Diamond Pond			2,000
Hobson, Judith River			10,500
Judith River, Middle Fork			2,000
Judith River, North Fork			7,500
Kalispell, Doll's lake			2,000
Lenia, Mountain Brook			500
Livingston, Bellman Creek			2,500
Meredith's pond			500
Missoula, Belmont Creek			2,000
Big Blackfoot River			3,000
Camas Creek			2,000
Gold Creek			2,000
Montour Creek			3,000
Pony, South Willow Creek			7,500
Red Lodge, Black Canyon Lake		8,000	
Black Fork Lake		6,000	
Frozen Lake		8,000	
Lower Hell Roaring Lake		6,000	
Roberts, Rock Ford River			4,500
Townsend, Crow Creek			9,000
Deep Creek			9,000
Greyson Creek			6,000
Missouri River			10,000
Wibaux, Box Elder Creek			2,000
Wilsall, Lower Flathead Creek			2,500
Upper Flathead Creek			2,500

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Nebraska:			
Gretna, Long Pine Creek			20,000
Nevada:			
Steptoe, Lussetti's pond			200
Verdi, State fish commission	100,000		
New Hampshire:			
Belmont, Clough Pond			250
Canaan, Andrews Brook			750
Franklin, Chance Brook		3,000	
Punch Brook		3,000	
Lake Sunapee, Baptist Brook			250
New Jersey:			
Butler, Pequannock River			1,200
Chatsworth, Board Pond			900
Hackettstown, State fish commission	100,000		
Morristown, Badgley Pond			300
Lee Meadow Brook			1,200
Princeton, applicant	4,000		
Ridgewood, Belmar Springs Lake			600
Whipany, Spring Brook			300
New Mexico:			
Aztec, Animas River			5,000
Las Vegas, Blue Cannon Creek			350
Falls Cannon Creek			225
Grindstone Cabin Creek			350
Montoya, Blanco Pond			500
Crystal Springs Pond			500
Servilleta, Valdez Pond			2,000
Tularosa, Rio Bonito			500
Ruidioso River			500
Ute Park, Bitter Creek			500
Red River			750
New York:			
Benson Mines, Star Lake			3,000
Binghamton, Choconut Creek			1,600
Pages Brook			1,600
Thomas Brook			800
Chittenango, Chittenango Creek			3,200
Great Bend, Black Creek			3,000
Hornell, Bishopville Creek			1,600
Canacadea Creek			1,600
Lime Kiln Creek			1,600
Lyons, Glenmart Creek			2,400
New York City, New York Aquarium	5,000		
Oneonta, Anderson Brook			800
Charlotte Creek			2,400
Gay Brook			800
Houck Brook			800
Knapp Brook			800
Ouleout Creek			2,400
St. Johnsville, Garoga Creek			2,400
Suffern, Tallman Brook			600
Syracuse, Butternut Creek			3,200
Limestone Creek			2,400
Onondaga Creek			2,400
Pecks Brook			2,400
Watertown, Jacobs Creek			4,400
North Carolina:			
Brevard, Allison's pond			5,000
Bryson, Lands Creek			5,000
Collettsville, Upper Mulberry Creek			4,000
Cranberry, Blevins Creek			5,000
Cranberry Creek			5,000
Crestmont, Baxter Creek			3,000
Bear Creek			4,000
Big Cataloochee Creek			8,000
Big Creek, Laurel Fork			5,000
Big Creek, Swallow Fork			5,000
Chestnut Creek			3,000
Indian Creek			3,000
Little Cataloochee Creek			4,000
Low Branch Gap Creek			2,000
Poplar Creek			5,000
Upper Big Creek			3,000
Yellow Creek			3.000
Dillsboro, Billy Creek			4.000
Doughton, Little River			3,000
Elk Park, Watauga River, branch of			4.000

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
North Carolina—Continued.			
Farner, Cherokee Lake			16,000
Franklin, Ellijay Creek			5,000
Hendersonville, Rainbow Lake			4,000
Huntdale, Sams Branch			10,000
Lake Toxaway, Fairfield Lake			20,000
Lake Toxaway			5,000
Linville Falls, Linville River			30,000
Marion, Buck Creek			15,000
Buck Creek, Devils Fork			10,000
Burgin Creek			10,000
Catawba River, Rock Fork			1,000
Davidson Mill Creek			1,000
Dysart Mill Creek			1,000
English Creek			1,000
Johnson Creek			5,000
McCall Creek			1,000
Mackeys Creek			1,000
Montford Cove Creek			1,000
Nicks Creek			1,000
Reedy Branch			5,000
Shadricks Creek			1,000
Wildcat Creek			6,000
Marshal, Willow Pond			500
Montezuma, Big Grassy Creek			3,000
Grandmother Creek			3,000
Kawana Lake			4,000
Linville River			9,000
Linville River, West Fork			2,000
Mount Sterling, Hopkins Creek			6,000
Laurel Creek			6,000
Mount Sterling Creek			5,000
Murphy, Hiawatha River			3,000
Peach Tree Creek			2,000
North Wilkesboro Buffalo Creek, Joes Fork			5,000
Buffalo Creek, Upper			10,000
Dugger Creek			7,000
Elk Creek, Upper			5,000
Rock House Creek			5,000
Ronda, Lake Neuchalet			2,000
Rutherfordton, Dickerson's pond			3,000
North Dakota:			
St. John, State fish commission	40,000		
Ohio:			
Bellefontaine, Spring Branch		3,000	
Stony Creek		3,000	
Bellville, Bells Run			2,000
Gatton's lake			400
Kocheiser Run			1,200
Lockheart Run		1,000	
Castalia, Colt Creek			1,500
Lexington, Groff Run			800
Mansfield, Bear Lake			800
Cullers Creek		6,000	
East Branch			1,100
Fackler Run			1,600
Gribbings Run			2,000
Johnville Creek			2,000
Kings Creek		3,000	
Koogles Run		5,000	
Lafayette Creek			2,000
Lucas Run			1,000
Medina Pond		1,000	
Pleasant Valley Creek			1,600
Rocky Fork Creek		4,000	
Simmons Run		5,000	
Styerts Creek		3,000	
Wise Lake			600
Wood House Creek			1,600
Middlefield, Bylers Pond		1,000	
Plymouth, Huron River, East Branch			1,500
Oklahoma:			
Carrier, Jungle Lake			800
Crescent, Lake Haney			150
Hickory, Crystal Pond			500
Horse Shoe Lake			1,000
Hugo, Roebuck Lake			200
Roff, Byrds Mill Creek			1,000

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Oregon:			
Bonneville, State fish commission	200,000		
Brownsville, Callapooia River			19,800
La Grande, Heidenrich's pond			3,000
Milton, Birch Lake			1,000
Portland, Crystal Lake			1,000
Poppleton's pond			2,000
Union Junction, Catherine Creek			3,000
Pennsylvania:			
Ackermanville, Ackermanville Creek			1,600
Martins Creek			1,600
Old Delabole Creek			800
Altoona, Juniata River, branch of			2,000
Little Juniata River			2,000
Ambler, Pike Creek			300
Birdsboro, Molasses Creek			1,800
Boiling Spring, Old Town Run			2,000
Chambersburg, Conococheague Creek			700
Falling Spring, East and West Branches			525
Spring Run			1,000
Christiana, Brookside Run			2,000
Johnson Run			2,000
Craigheads, Yellow Breeches Creek			3,000
Denver, Bull Rush Run			900
Easton, Bushkill Creek			2,400
Ebensburg, East Chest Creek			105
Ephrata, Slumps Run			900
Trout Run			900
Fairchance, Du Pont Pond			180
Friedens, Breast Works Creek			1,000
Coxes Creek			1,000
Dark Shade Creek			1,000
Piney Run			1,000
Glen Mawr, Muncy Creek			3,000
Gouldsboro, Lehigh River			2,400
Trout Creek			2,400
Hoadleys, Beecher Run			1,000
Jersey Shore, Larrys Creek			2,000
McLarens Run			2,000
White Creek			2,000
Johnstown, Bens Creek			70
Bens Creek, North Fork			70
Bens Creek, South Fork			70
Blue Hole Run			70
Brush Creek			70
Cranberry Glae Run			70
Crystal Spring Run			1,000
Drakes Run			70
Elk Lick Run			70
Fishing Run			70
Flaugherty Creek			105
Grays Run			70
Hills Creek			105
Laurel Run			70
Millstone Run			2,000
Mineral Point Pond			70
Pine Run			70
Runnells Mill Run			70
Solomons Run			70
Stuart Run			70
Town Line Run			70
Upper Dark Shade Run			70
West Branch			70
Whites Creek			105
Lancaster, Baumgardner Run			2,000
Cromer Run			300
Meadow Brook			1,000
Mill Creek, headwaters			3,000
Myers Run			1,300
Weidners Run			1,000
Zorks Run			1,000
Latrobe, Armel Hollow Run			180
Lynn Run			270
Wolf Spring Run			90
Lemont, Big Spring Run			1,000
McBrides Gap Run			1,000
Ligonier, Linns Run			2,000
Lloydell, Beaver Run			3,000
South Fork Creek			2,000

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Meyersdale, Brush Creek			540
Elk Lick Creek			360
Laurel Run			270
Ware Run			270
Wills Creek			360
Mill Hall, Heards Big Spring Ponds			1,000
Long Run			3,000
Minersville, Crystal Run			900
Deep Creek			900
Ice Lake			900
Lakear Lake			1,200
Moselm, Moselm Creek			2,100
Mount Union, Black Log Creek			1,000
Carmichaels Branch			1,000
Carters Run			1,000
Germany Valley Creek			1,000
Licking Creek			1,000
Roberts Run			2,000
Scrub Gap Run			1,000
Singers Gap Run			1,000
Strodes Mill Creek			3,000
Nanticoke, Big Wapwallopen Creek			1,600
Harveys Creek			1,600
Hemlock Creek			800
Huntington Creek			1,600
Kitchens Creek			800
Landys Run			800
Little Wapwallopen Creek			800
Peggy Hunter Run			800
Newville, Laurel Run			3,000
Nicholson, Bell Creek			2,400
Graham Creek			2,400
Osceola Mills, Trout Run			1,500
Phillipsburg, Ardels Run			500
Barkers Run			500
Bark Shed Run			500
Beaver Run			1,000
Belgers Run			500
Biglow Run			500
Big Spring Run			500
Black Bear Run			500
Black Moshannon Creek			500
Buttell Run			500
Clover Run			500
Coal Creek			500
Cold Spring Run			500
Corbin Run			500
Curry Run			500
Dayton Run			500
Deep Rock Run			500
Echo Run			500
Flat Rock Run			500
Forge Run			500
Four Mile Run			500
Hazzards Run			500
Hutton Run			500
Laurel Run			500
Little Beaver Run			500
McCords Run			500
Moravian Run			500
Nasons Run			500
One Mile Run			500
Patten Run			500
Pine Run			500
Sensers Run			500
Seven Spring Run			500
Shields Run			500
Six Mile Run			500
Slate Run			500
Sleepy Hollow Run			500
Smayes Run			500
Spruce Run			500
Stash Run			500
Sterling Run			500
Tomahawk Run			500
Tom Tit Run			500
Trout Run			500
Turtle Spring Run			500
Twiggs Run			500

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Phillipsburg, Vails Run			500
Winburne Run			500
Wolf Run			500
Quarryville, Conowingo Creek			500
Reading, Beaver Run			1,800
Big Northkill Creek			1,800
Big Six Penny Creek			2,700
Cedar Creek			900
Hopewell Creek			2,700
Little Six Penny Creek			1,800
Mount Penn Creek			1,800
Roaring Branch, Elk Run			1,000
Frenchmen Lick Run			1,000
Mill Creek			1,000
Roaring Branch Creek			1,500
Salt Spring Creek			1,000
Sugar Works Run			1,000
Slate Run, Big Run			1,000
Cider Run			1,000
Little Pine Creek			1,000
Pine Creek			2,000
Slate Run			1,000
Tamaqua, Beaver Run			70
Kistler Run			70
Kramers Run			105
North Creek			70
Tower City, Clarks Creek			2,000
Valley Forge, Knox's pond			1,000
Virginville, Moselm Creek			1,000
Waynesboro, Antietam Creek, West Branch			3,000
Caufmans Run			2,000
Falls Creek			2,000
Nunnery Run			2,000
Spring Lake			1,000
Windber, Beaver Creek			1,000
Big Shade Creek			1,000
Bobbs Creek			1,000
Clear Shade Creek			3,000
Coal Run			1,000
Conemaugh River, South Fork			1,000
Cut Run			1,000
Dark Shade Creek			1,000
Laurel Run			1,000
Miller Run			1,000
Otter Run			1,000
Shingle Run			1,000
Sienna Run			1,000
Wentze Run			1,000
South Carolina:			
Mayesville, Tiller's pond			1,000
Pickens, Eastake Creek			5,000
Whitewater Creek			6,000
River Falls, Gap Creek			5,000
South Dakota:			
Alpena, Albert Pond			500
Astoria, Fish Lake			800
Oak Lake			1,100
Fort Pierre, Marten's pond			900
Mystic, Rapid Creek Pond			1,000
Parkston, Winter's pond			600
Pollock, Morphodite Creek			2,600
Rapid City, Indian School Lake			600
Tennessee:			
Arthur, Davis Creek			10,000
Ducktown, Rough Creek			15,000
Dyer, Hudson's pond			500
Greenville, Reaves's pond			2,000
Hampton, Simerly Creek			8,000
Johnson City, Cedar Creek			5,000
Glen Ridge Creek			1,000
Knoxville, Jakes Creek			7,000
Little River			10,000
Little Pigeon River, East Fork			10,000
McFarland, Smith Creek			10,000
Mountain City, Cress Lake			500
Gentrys Creek			3,000
Okolona, Buffalo Creek			8,000
Prospect, White's pond			300
Sparta, Running Town Creek			4,700

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Tennessee—Continued.			
Summertown, Buffalo River			15,000
Telford, Moore's pond			2,000
Townsend, Little River, West Prong			15,000
Turtle town, Wolf Creek			15,000
Utah:			
Buena Vista, Holmberg's pond			200
Ephraim, Shumway Springs Pond			200
Hyrum, Rose's pond			100
Milford, Meadow Springs Pond			200
Millville, Meadow Spring Run			200
Murray, Jameson's pond			100
Ogden, Stephens's pond			200
Provo, Provo River			600
Richfield, Center Lake			200
Richmond, Gregory's pond			200
Springville, State fish commission	100,000		
Vermont:			
Marshfield, Winooski River		3,000	
Plainfield, Bancroft River		1,000	
Kingsbury Branch		1,000	
Large Brook		1,000	
North Montpelier Pond		1,000	
Pekin Branch		1,000	
White Brook		1,000	
Winooski River		3,000	
St. Johnsbury, Sleepers River			9,500
Virginia:			
Abingdon, Green Cove Creek			3,000
White Top Creek			3,000
Covington, Castle Run			1,000
Hazes Gap Branch			1,000
Mill Branch			1,000
Elma, Dutch Creek			500
Emporia, Country Club Pond			1,200
Fagg, Big Trap Run			300
Hamilton, Silver Run			800
Interior, Big Stony Creek			2,500
Keysville, May's pond			200
Lennig, Armstead's pond			500
Longdale, Simpson Creek			5,000
Low Moor, Karnes Creek			4,000
Manteo, Johnson's pond			200
Marion, Dickeys Creek			10,000
Fox Creek			10,000
Staleys Creek			10,000
Natural Bridge, Elk Creek			1,000
Prospect, Forest Green Pond			100
Garden's pond			400
Pulaski, Sproul Branch			250
Spring Hill, Bullneck Branch			4,000
Starkey, Bottom Creek			300
Staunton, Jackson River			1,500
Trout Dale, Fox Creek			2,000
Wytheville, Tates Run			300
Washington:			
Aberdeen, Chehallis River			5,000
East Hoquiam River			2,000
North River			5,000
Satsop River			4,500
Bellingham, Lake Louise			2,000
Lake Wildwood			2,500
Coleville, Black Lake			3,000
State fish commission	75,000		
Elberton, Palouse River			3,000
Ellensburg, Applicant	50,000		
Ewan, Rock Lake			5,000
Neppel, Moses Lake			3,000
North Yakima, Wenas Storage Reservoir			2,000
Omak, Smith Lake			1,000
Republic, Crawfish Lake			2,000
Curlew Lake			2,000
San Pail Lake			2,000
Robe, Echo Lake			3,000
Rockport, Sunny Brook			4,000
Seattle, Norum Creek			500
Spring Brook Pond			500
Valley, Bond Lake			1,000
Wilbur, Wilbur Creek			1,500
Woodland, Surveyor Lake			1,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
West Virginia:			
Berkeley Springs, Cold Run			450
Indian Run			270
Rock Gap Run			270
Carpenter, Blue Creek			5,000
Grafton, Lost Run			360
Hendricks, Elk Lick Creek			4,000
Mabie, Roaring Creek			360
Marlinton, Elk River			6,000
Raleigh, Little Beaver Creek			1,500
Piney River			1,500
Spangler, Elkwater River			1,200
Stewarts Run			800
Spring Creek, Myles Pond			600
Terra Alta, Rhyme Creek			450
Thomas, Blackwater River, North Fork			425
Whyte, Stalnaker Run			3,000
Wisconsin:			
Alma, Waumandee Creek			8,000
Alma Center, Olson Creek			750
Amery, Mounds Creek			2,100
Amherst, Tomorrow River			4,800
Antigo, Red River			3,750
Athelstane, Peshtigo River			2,400
Barneveld, Shannon Branch			1,500
Smith Branch			2,250
Bartow, Rock River			3,000
Bessemer, Little Presque Isle River			2,000
Bloomer, Duncan Creek			1,000
Blue Mounds, Avangs Run			750
Bohris Creek			200
Boleys Creek			200
Brunners Run			750
Dimples Creek			200
Dohertys Run			750
McKinleys Creek			1,050
Royjiks Run			750
Toppers Creek			1,050
Cable, Big Brook			2,000
Cashton, Aarnes Creek			1,000
Almelien Run			1,000
Colfax, Eighteen Mile Creek			600
Mirror Lake			200
Crystal Falls, Paint River			1,000
Deer Park, Willow River			4,000
Eagle River, Finger Creek			400
Eleva, Adams Creek			400
Bennett Valley Creek			600
Big Creek			800
Englesby Creek			400
Hoven Creek			600
Lindsay Creek			400
Rosman Creek			400
Tollefson Creek			400
Trout Creek			600
Ellsworth, Lost Creek			1,000
Elroy, Ritland's pond			200
Fairchild, Black Creek			2,000
Flick Creek			1,000
Harsons Creek			1,000
Hay Creek			2,000
Searls Creek			1,000
Snake Creek			1,000
Thompson Creek			1,000
Glen Flora, Bear Creek			3,100
Big Jump River			1,000
Deer Tail Creek			10,100
Devils Creek			1,000
Flambeau River			4,000
Hickey Creek			600
Little Jump River			3,000
Main Creek, Middle Fork			4,000
Main Creek, North Fork			2,000
Main Creek, South Fork			2,000
Main Creek, West Fork			1,000
Pine Creek			2,100
Skinner Creek			6,000
Skinner Creek, South Fork			1,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Glen Flora, Skunk Creek			2,100
Stickey Creek			1,000
Glen Haven, Grant River, Blakes Fork			800
Hawkins, Burgess Creek			2,000
Elm Creek			3,000
Little Jump Creek			1,000
Main Creek			3,500
Moss Creek			1,900
Otter Creek			1,000
Pine Creek			4,100
Trout Brook			2,000
Hayward, Namakagon River			5,000
Spring Creek			1,000
Independence, Bennett Creek			4,000
Bjerkland Creek			2,000
Bruce Valley Creek			2,000
Chimney Rock Creek			3,000
Davis Creek			2,000
Elk Creek, North Branch			2,000
Elk Valley Creek			4,000
Farrs Creek			2,000
Filler Creek			2,000
Hawkenson Creek			2,000
Holman Creek			2,000
Hulberg Creek			2,000
Ignatz Lygas Creek			400
Johnson Creek			2,600
Kurths Creek			2,000
Linden Creek			2,000
Maloney Creek			2,000
North Branch Creek			1,200
Olson Creek			600
Papes Creek			2,000
Plum Creek			1,200
Schaffners Creek			2,600
Solfest Creek			2,000
Traverse Creek			3,000
Utes Creek			2,400
Van Tassell Creek			2,000
Warner Creek			2,000
Wickersham Valley Creek			2,000
Kendall, Lumsden Creek			600
Tunnell Creek			400
La Crosse, Borchert Creek			5,000
Halfway Creek			5,000
Spring Branch			5,000
Ladysmith, Little Thornapple River			2,100
Mad Creek			2,100
Main Creek, South Fork			2,100
Lansing, Village Creek			6,000
Maiden Rock, Rush River			4,000
Manitowoc, Black Creek			2,400
Devil River			3,300
Francis Creek			1,600
Manitowoc River			4,600
Mishicott River			900
Pierces Creek			800
Upper East Twin River			2,400
Upper Manitowoc River			2,100
Menomonie, Hay River, North Fork			4,000
Hay River, South Fork			4,000
Lambs Creek			2,000
Mud Creek			2,000
Tiffany Creek			2,000
Minocqua, Three Mile Creek			1,600
Tomahawk River			4,000
Nashville, Lost Lake Creek			1,500
Spring Creek			1,500
Newry, Freming Run			1,000
Jersey Creek			1,000
Homstad Run			1,000
Sveen Run			1,000
Nye, Horse Creek			1,200
Johnson Lake			2,100
Oakfield, Park Creek			300
Oconomowoc, Cedar Creek			900
Owen, Mohr Creek			2,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Randalia, Cooley Pond			1,500
Rhinelander, Manson Creek			400
Rice Lake, Angler Creek			2,000
Big Bear Creek			2,000
Bonry Creek			2,000
Brice Creek			2,000
Cobb Creek			2,000
Devils Creek			2,000
Fisher Creek			2,000
German Creek			2,000
Hickey Creek			2,000
Long Lake Creek			2,000
Meadow Creek			1,000
Miller Creek			2,000
Moosier Creek			2,000
Pine Creek			2,000
Red Cedar River			2,000
Rice Creek			2,000
Rock Creek			2,000
Spring Creek			1,000
Spur Nine Creek			2,000
Thirty Three Creek			2,000
Weirgor Creek			2,000
Yellow River			2,000
Richland Center, Mill Creek, West Branch			1,000
Pine Creek			3,000
Willow Creek			1,500
Solon Springs, Young Lake			1,000
Spring Green, Honey Creek			1,000
Spring Valley, Cady Creek			2,300
Eau Galle River			4,000
Gilbert Creek			1,950
Rush River			1,950
Stanley, Eau Claire River, North Fork			1,000
Leavil Creek			800
Wolf River			1,000
State Line, Portage Creek			3,000
Spring Creek			800
Tomahawk, Big Pine Creek			1,000
Big Pine Creek, South Branch			600
Trempealeau, Fox Creek			1,000
Waldo, Oastere Spring Creek			1,600
Waukesha, Harlands Creek			600
Loves Creek			600
White River and tributaries			3,200
Westby, Baglien Run			1,000
Bloomingdale Creek			1,000
Danue Run			1,000
Dickson Creek			1,000
Haillen Run			1,000
Holte Run			1,000
Knopp Creek			1,000
Larson Run			1,000
Moller Run			1,000
Norbo Run			1,000
Oium Run			1,000
Olson Branch			1,000
Overhagen Run			1,000
Pederson Creek			1,000
Sanbakken Run			1,000
Sending Creek			1,000
Skoersmen Creek			1,000
Smeby Run			1,000
Spring Valley Creek			1,000
Steenson Run			1,000
Sveum Run			1,000
Tomten Run			1,000
Wyoming:			
Basin, Spring Lake			8,000
Beulah, Elmore Pond			250
Cody, Muddy Creek Lake			4,000
Gillette, Wright's pond			500
Laramie, North American Lake			1,000
State fish commission	75,000		
Lysite, Bridger Creek			3,000
Manderson, Medicine Lodge Lake			2,000
Paint Rock Lake			3,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

RAINBOW TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wyoming—Continued.			
Ranchester, Decker Reservoir			500
Wolf Creek			1,500
Rock Springs, East Fork River			500
Green River			500
Pine Creek			1,500
Pole Creek			500
Sheridan, Big Goose Creek, East Fork			1,500
Big Horn River	68,750		
India:			
Punjab, British Government	40,000		
Japan:			
Kobe, Department of Agriculture	200,000		
Tokyo, Department of Agriculture	200,000		
Total[a]	2,022,990	568,930	2,144,875

ATLANTIC SALMON.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Maine:			
East Orland, Penobscot River, East Branch		1,804,313	

LANDLOCKED SALMON.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Idaho:			
Hay Spur, Applicant	10,000		
Redfish Lake	15,000		
Maine:			
Abbot Village, Sebec Lake			750
Augusta, Lake Cobbosseecontee		8,000	900
Blanchard, Bunker Pond			300
Bodfish, Midday Pond			450
Bryants Pond, Lake Twitchell		5,000	
Dedham, Manns Brook		26,000	
East Machias, Gardner Lake			600
Ellis Siding, Cathance Lake			600
Enfield, Cold Stream Lake		8,000	
Farmington, Clear Water Lake		3,000	450
Sweets Pond		5,000	
Varnum Pond		6,000	
Franklin, Donnell Pond			600
Fryeburg, Lake Keyar		8,000	
Grand Lake Stream, Dobsis Lake		24,000	24,000
Grand Lake		93,042	49,358
Green Lake, Green Lake			1,000
Jackman, Arnold Pond		8,000	
Little Big Wood Lake		5,000	
Kineo, Moosehead Lake		10,000	
Scotean Creek		4,000	
Lambert Lake, Lambert Lake			450
Monson Junction, Piper Pond			3,500
Norway, Allen Pond		4,000	
Lake Kewayden		6,000	2,400
Virginia Lake		10,000	1,800
Otis, Great Brook		28,000	632
Perry, Boyden Lake			750
Princeton, Farrar Lake		5,000	450
Raymond, State fish commission	100,000		
Riccars, Lower Range Lake			300
Rockland, Chickawaukee Lake			300
Springdale, Mousam Lake			600
Union, Crawford Pond			300
Walker Siding, Squa Pan Lake			750
Waterville, Britton Lake		8,000	
West Paris, Concord Pond			300
Shagg Pond			300
Wilsons Mills, Parmacheenee Lake		8,000	
Winn, Number Three Lake		5,000	
Massachusetts:			
Amesbury, Lake Attilash		2,000	
Fitchburg, Lawrence's pond		1,000	

[a] Lost in transit, 18,188 fingerlings.

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LANDLOCKED SALMON—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Massachusetts—Continued.			
Lenox, Stockbridge Lake		2,000	
Palmer, State fish commission	15,000		
Still River, Barre Hill Pond		2,000	
Worcester, Lake Quinsigamond			900
Michigan:			
Doster, Pine Lake		4,000	
Oscoda, Cook Lake		4,000	
Sault Ste. Marie, State fish commission	15,000		
Minnesota:			
Knife River, Nepissiquit Lake			3,000
Tettegouche Lake			3,500
Montana:			
Bozeman, Bridger Creek			5,000
Whitefish, Whitefish Lake			2,000
New Hampshire:			
Ashland, Squam Lake			2,430
Bartlett, Sawyer Lake		3,000	
Bristol, Newfound Lake			3,000
Canaan, Tewksbury Pond			1,000
Colebrook, State fish commission	30,000		
Enfield, Bicknell Brook			1,000
Crystal Lake			1,000
Littleton, Forest Lake			900
Partridge Lake		3,000	
New Jersey:			
Hackettstown, State fish commission	25,000		
New York:			
Carmel, Lake Mahopac			4,000
Long Lake West, Little Tupper Lake	10,000		
New York City, New York Aquarium	1,000		
Old Forge, State fish commission	20,000		
Raquette Lake, Lake Kora	10,000		
Tuxedo, Applicant	10,000		
Willsborough, Warm Pond			500
Vermont:			
Averill, Little Averill Lake			2,000
Beebe Junction, Derby Pond			500
Salem Pond			500
Island Pond, Seymore Lake			3,000
Norton Mills, Big Averill Lake			445
Orleans, Long Pond			1,000
Willoughby Lake			1,000
Roxbury, State fish commission	30,000		
Salisbury, Lake Dunmore			1,000
Wisconsin:			
Amherst Junction, Lake Emily			8,000
Coloma, Pleasant Lake			3,000
Wood Lake			3,000
Three Lakes, Thunder Lake			2,500
Total[a]	291,000	310,042	140,015

SCOTCH SEA TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Maine:			
East Orland, Alamoosook River		38,968	
Toddy Pond		19,462	
Total		58,430	

BLACKSPOTTED TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado:			
Alma, Buckskin Creek			9,000
Mosquito Creek			12,000
Sacramento Creek			6,000
South Platte River, North Fork			12,000
Antero, Antero Reservoir			20,000
Antonito, Lower Conejos Creek			10,000
Upper Conejos Creek			50,000

[a] Lost in transit, 3,000 fry, 535 fingerlings.

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado—Continued.			
Aspen, Castle Creek			14,000
Hunter Creek			14,000
Hunter Creek, South Fork			8,000
Independence Lake			16,000
Lincoln Creek			14,000
Lost Man Lake			16,000
Maroon Creek			14,000
Owl Creek			8,000
Roaring Fork River			16,000
Willow Creek			16,000
Willow Lake			20,000
Baldwin, Pass Creek			10,000
Basalt, Black Mountain Lake			12,000
Beaver, Lake McNeill			20,000
Blackhawk, Upper North Clear Creek			8,000
Boulder, Middle Boulder Creek			16,000
North Boulder Creek			8,000
South Boulder Creek			16,000
Breckenridge, Spruce Creek			10,000
Buena Vista, South Cottonwood Creek			12,000
Carbondale Avalanche Creek			10,000
Cardinal, Cardinal Creek			6,000
Develen Lake			6,000
Middle Boulder Creek			21,000
North Boulder Creek			12,000
Cascade, Cascade Creek			6,000
Trout Creek			10,000
Cebolla, Cebolla Creek			20,000
Gunnison River			50,000
Cimarron, Big Cimarron River			20,000
Crater Lake			10,000
Little Cimarron River			12,000
Little Cimarron River, West Branch			10,000
Lost Lake			8,000
Clyde, Middle Beaver Creek			8,000
Coke Ovens, East Dolores River			14,000
West Dolores River			14,000
Cotopaxi, Arkansas River			10,000
Creede, Rio Grande River			76,000
Crested Butte, Coal Creek			10,000
Curtis, Uneva Lake	50,000		
De Beque, Big Creek			12,000
Big Creek Lake			12,000
Bull Creek			12,000
Buzzard Creek			12,000
Coon Creek			12,000
Grove Creek			12,000
Hawkshurst Creek			12,000
Lennox Creek			6,000
Mesa Creek			12,000
Park Creek			12,000
Plateau Creek			12,000
Roan Creek and tributaries			18,000
Delta, applicant	100,000		
Cottonwood Creek			10,000
Potter Creek			10,000
Youngs Creek			10,000
Denver, State fish commission	200,000		
Dillon, Brush Creek			9,000
Cataract Creek			9,000
Christison Lake			6,000
North Snake Creek			10,000
North Ten Mile Creek			10,000
Slate Creek			10,000
Straight Creek			10,000
Surprise Lake			6,000
Dyke, Devil Creek			14,000
Eagle, East Brush Creek			9,000
West Brush Creek			12,000
Fairplay, Four Mile Creek			15,000
Florence, Beaver Creek			21,000
Middle St. Charles Creek			12,000
South Hardscrabble Creek			12,000
Spring Creek			6,000
Fort Collins, Big South Ponds River			10,000
Deadman Creek			6,000
Laramie River			10,000
Nun Creek			6,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado—Continued.			
Fraser, Ranch Creek			2,000
Glaciers, Cement Creek			10,000
Ferris Creek			10,000
Taylor River, Lower			10,000
Granby, Columbine Creek			10,000
Grand Lake			20,000
Grand Lake, North Inlet			30,000
Grand River, North Fork			15,000
Strawberry Creek			9,000
Grand Junction, Kannah Creek			12,000
Granite, Mount Elbert Willow Creek			12,000
Tie Gulch Creek			6,000
Twin Lakes Creek			12,000
Grant, South Platte River, North Fork			120,000
Gypsum, Sweetwater Lake			15,000
Turret Creek			12,000
Hayden, Fish Creek			10,000
Williams River, South Fork			10,000
Hermosa, Hermosa Creek, lower			8,000
Hermosa Creek, upper			8,000
Hierro, Sun Creek			10,000
Hotchkiss, Crystal Creek			10,000
Gunnison River, Smith Fork			20,000
Leroux Creek			16,000
Idaho Springs, Bear Creek, upper tributaries			10,000
Truesdell Creek			5,000
Vance Creek			10,000
Ivanhoe, Ivanhoe Creek			10,000
Ivanhoe Lake			15,000
Janeway, Avalanche Creek			10,000
Jefferson, Geneva Creek			10,000
Lake City, Gunnison River, Lake Fork			20,000
Henson Creek, North Fork			8,000
Leadville, Mount Massive Willow Creek			10,000
State fish commission			200,000
Los Pinos, Los Pinos Creek, South Fork			14,000
Loveland, Big Thompson Creek, Millers Fork			6,000
Big Thompson Creek, North Fork			18,000
Big Thompson Creek, West Fork			6,000
Breistodt Lake			8,000
Fox Creek			6,000
Green Lake			6,000
Ypsilon Lake			8,000
Lyons, St. Vrain River			15,000
St. Vrain River, Middle Fork			30,000
St. Vrain River, North Fork			10,000
St. Vrain River, South Fork			10,000
Mack, Evacuation Creek			10,000
Marble, Carbonated Creek			6,000
Middle Thompson Creek			6,000
North Thompson Creek			6,000
Marshall, South Boulder Creek			12,000
Mears Junction, Poncho Creek			8,000
Meredith, Jakman Creek			6,000
Moffatt, Wild Cherry Creek Lake			14,000
Monte Vista, South Rock Creek			14,000
Upper Conejos Creek			14,000
Montrose, Clear Creek			6,000
Cottonwood Creek			8,000
Tabeguache Creek			10,000
Nast, Frying Pan River			18,000
Frying Pan River, South Fork			26,000
Nathrop, Browns Creek			10,000
New Castle, Beaver Creek			12,000
Canyon Creek			12,000
East Divide Creek			12,000
East Marvine Creek			12,000
Mauim Creek			12,000
West Divide Creek			12,000
West Marvine Creek			12,000
Norrie, Deeds Creek			6,000
Frying Pan River			12,000
North Cheyenne, Cheyenne Creek, North Fork			10,000
Pagosa Springs, Big Blanco River			10,000
Big Navajo River			10,000
Four Mile Creek			10,000
Little Blanco River			10,000
Little Navajo River			10,000
San Juan River, East Fork			10,000

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado—Continued			
Pagosa Springs, San Juan River, West Fork			10,000
Turkey Creek			10,000
Pando, Eagle River			30,000
East Eagle River			12,000
Paonia, Coal Creek			10,000
Parlin, Alder Creek			10,000
Beaver Creek, North Fork			10,000
Cochetopa Creek, East Fork			10,000
Cochetopa Creek, Lake Fork			6,000
Cochetopa Creek, West Fork			10,000
Pitkin, Snype Creek			4,000
Placerville, Beaver Creek			10,000
Quin Spur, Frying Pan River, North Fork			25,000
Red Cliff, Homestake Creek			12,000
South Homestake Lake			9,000
Redstone, Coal Creek			10,000
Rex, Cross Creek			12,000
Gore Creek			12,000
Piney Creek and tributaries			12,000
Treasure Vault Lake			12,000
Ridgway, Lou Creek			8,000
Owl Creek			6,000
Riverdale, Harvard Creek			12,000
Rollinsville, North Boulder Creek			10,000
South Boulder Creek			25,000
Rosemont, Beaver Creek, East Fork			20,000
Ruedi, Rocky Fork Creek			12,000
Saderlind, Gould Creek			15,000
St. Elmo, Taylor River, upper			20,000
Salida, Arkansas River			40,000
Cochetopa Creek			9,000
Poncho Creek			12,000
South Arkansas River			24,000
South Arkansas River, North Fork			12,000
Silverton, Ice Lake Creek			4,000
Mineral Creek			8,000
Minnie Creek			8,000
Molas Lake			10,000
Snow Mass, Capital Creek Lake			10,000
Sopris Lake			14,000
Steamboat Springs, Beaver Creek			5,000
Elk Head Creek			10,000
Mad Creek			10,000
Ranger Lakes			8,000
Snake River, headwaters			10,000
South Fork Lakes			10,000
Stoner Creek, Stoner Creek			14,000
Tabernash, Fraser River			5,000
Thomasville, Engelbrecht Lakes			150,000
Vasquez, Fraser River			8,000
Vasquez Creek			10,000
Villa Grove, Cotton Creek Lake			10,000
Walcott, Piney River			12,000
Walden, Kelly Lake			10,000
Yokum Creek			5,000
Walsenburg, Huerfano River			16,000
Lily Lake			8,000
Ward, Brainard Lake			15,000
Wheeler, Ten Mile Creek			10,000
West Ten Mile Creek			10,000
Windsor Lake, Windsor Lake			15,000
Woody, Woody Creek			10,000
Woody Creek, North Fork			8,000
Yampa, Morrison Creek			10,000
South Hunt Creek			10,000
Watson Creek, South Branch			8,000
Youman, Elk Creek			6,000
Fall Creek			6,000
Little Cimarron Creek			10,000
Idaho:			
Boise, State fish commission	250,000		
Idaho Falls, Willow Creek		20,000	
Michigan:			
Detroit, Detroit Aquarium	10,000		
Montana:			
Alder, Ruby River		25,000	
Anaconda, Cable Creek		5,000	
Deep Creek		7,500	
Dempsey Creek		5,000	

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Montana—Continued.			
Anaconda, Dutchman Creek		7,500	
German Gulch Creek		5,000	
La Marsh Creek		5,000	
Lost Creek		7,500	
Mill Creek		10,000	
Race Track Creek		5,000	
Rock Creek, East Fork		5,000	
Seymour Creek		7,500	
State fish commission	400,000		
Trout Creek		7,500	
Twin Lakes Creek		7,500	
Warm Springs Creek		7,500	
Willow Creek		7,500	
Armstead, Horse Prairie Creek		20,000	
Ballantine, Arrow Creek			6,000
Belgrade, Dry Creek		12,500	
Reese Creek		12,500	
Belton, Avalanche Creek		7,500	
Bowman Lake		7,500	
Lake McDonald		10,000	
Logan Lake		7,500	
McDermott Lake		10,000	
Reynolds Lake		7,500	
Benton, Highwood Creek		15,000	
Shonkin Creek		20,000	
Big Timber, Big Timber Creek		15,000	3,000
Boulder Creek		17,500	4,500
Duck Creek			3,000
Lake Walvoord		17,500	
Bozeman, Asbestos Creek		5,000	
Bozeman Creek		10,000	
Bostwick Creek		5,000	
Bracket Creek		10,000	4,500
Buck Creek		5,000	
Cache Creek		5,000	
Cherry Creek			6,750
Daly Creek			4,500
Dry Creek, South Fork			4,500
Hell Roaring Creek			4,500
Hub Creek			4,500
Jackel Creek			4,500
Logger Creek			4,500
Mystic Lake		10,000	
North Cottonwood Creek		5,000	
North Twin Lake			4,500
Sales Lake			4,500
South Twin Lake			4,500
Swan Creek		5,000	
Tice Creek		5,000	
Trail Creek		5,000	
West Bear Creek		5,000	
West Fork Creek		10,000	
Wild Horse Creek		10,000	
Wilson Creek		5,000	
Butte, applicant	400,000		
Clancy, Little Prickly Pear Creek			5,000
Warm Springs Creek			5,000
Clyde Park, Bracket Creek		10,000	
Canyon Creek		10,000	
Cottonwood Creek		12,500	
Horse Creek		12,500	
Rock Creek		10,000	
Shields River		20,000	
Spring Creek		7,500	
Trowbridge Creek		5,000	
Columbus, Stillwater River			6,000
Dell, Redrock Creek			18,000
Devon, Poplar Creek Reservoir		2,500	
Emigrant, Dailies Lake		15,000	
Forest Grove, Hell Creek		4,500	
Glacier Park, Altyn Lake		7,500	
Gunsight Lake		7,500	
Upper St. Marys Lake		10,000	
Hobson, Judith River, South Fork		20,000	
Iron Mountain, Cedar Creek		6,750	
Deep Creek		6,750	
Dry Creek		6,750	
Fish Creek		6,750	

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Montana—Continued.			
Iron Mountain, Flat Creek		4,500	
Fourteen Mile Creek		6,750	
Johnston Creek		4,500	
Lost Gulch Creek		6,750	
Oregon Gulch Creek		6,750	
Quartz Creek		6,750	
Thompson Creek		6,750	
Trout Creek		6,750	
Josephine, Middle Creek			12,000
Lewistown, Armells Creek			4,500
Casino Creek			3,000
Cottonwood Creek		11,250	
Flatwillow River, North Fork		6,750	
Flatwillow River, South Fork		4,500	
Little Rock Creek			3,000
McCortney Creek		4,500	
McDonald Creek, North Fork			4,500
McMillan's pond		2,250	
Shipman Creek		2,250	
Spring Creek		15,750	
Tyler Creek		9,000	
Wolverine Creek		4,500	3,000
Libby, Quartz Creek			10,500
Livingston, Lower Shields River		20,000	
Yellowstone River		20,000	
Manhattan, Ayles Creek		10,000	
Miner, Miner Creek		25,000	
Rock Creek		12,500	
Missoula, Spring Creek		4,500	
Three Mile Creek		15,750	
Moore, Judith River, Ross Fork		13,500	
Muir, Upper Billman Creek		10,000	
Pray, Mills Creek		10,000	
Strawberry Creek		15,000	
Ridge, Thompson Creek			2,000
Rock Hill, Harrison Lake		10,000	
Shawmut, Fish Creek, South Fork		12,500	
Somers, Flathead Lake			22,500
Springdale, Duck Creek		15,000	
Summit, Castle Lake		2,250	
Warm Springs Creek		6,750	
Thompson Falls, Clear Creek		6,750	
Prospect Creek		6,750	
Thompson River		11,250	
Two Dot, Cottonwood Creek		13,500	
White Sulphur Springs, Newlan Creek		11,250	
Smith River		11,250	
Wilsall, Flathead Creek		45,000	
Shields River		20,000	10,000
Spring Creek			10,000
Nebraska:			
Chadron, Dead Horse Creek			2,700
Colclesser, Pine Creek			2,700
New Mexico:			
Carlsbad, Lake Bujac			4,000
Cimarron, Ponil Creek			5,000
Dexter, Lake Durand			2,000
Espanola, Santa Clara River			28,000
Glorietta, Cow Creek			10,000
Pecos River			30,000
Lamy, Santa Fe River			20,000
Las Vegas, Gallinas River			25,000
Raton, Sugarite Creek			15,000
Santa Fe, Tesuque River			20,000
State fish commission	100,000		
Silver City, Black Canyon Creek			10,000
Dry Creek			10,000
Gila River, Middle Fork			10,000
Gila River, West Fork			10,000
Mimbres River			10,000
Mineral Creek			10,000
Mogollon Creek			10,000
Turkey Creek			10,000
Whitewater Creek			10,000
Tularosa, Rio Ruidioso			10,000
New York:			
New York City, New York Aquarium	25,000		

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Oregon:			
Bonneville, State fish commission	500,000		
Clackamas, State fish commission			51,100
Hubbard, Rock Creek			20,000
Nekoma, Indian Creek			20,000
Trail, Elk Creek		40,000	467
South Dakota:			
Berne, Pettit's pond			1,200
Cleghorn Springs, Cleghorn Pond			9,000
Cleghorn Spring Creek			3,600
Dark Canyon, Bogus Jim Creek			9,000
Sicklers Pond			3,600
Hermosa, Battle Creek			2,700
Iron Creek, Iron Creek			24,000
McGee, Halleys Lake			9,000
Price Pond			3,600
Mystic, Cottonwood Lake			5,000
Dakota Power Lake			5,000
Lime Creek			5,000
Lime Kiln Pond			5,000
Nugget Creek			10,000
Prairie Creek			9,000
Rapid Creek			20,000
Scotts Pond			3,600
Slate Creek			10,000
Victoria Creek			9,000
West Nugget Creek			3,600
Rapid City, City Springs Run			3,600
Harters Pond			3,600
Jim Creek			9,000
Murphys Pond			3,600
Rounds Pond			3,600
Schleunings Pond			3,600
Spades Lake			3,600
Rochford, Gold Run			5,400
Silver Creek			9,000
Sheridan, Spring Creek			16,000
Spearfish, Crow Creek			18,000
Spearfish Creek			300,000
Whitewood, Christenson's pond			1,350
Utah:			
Murray, State fish commission	100,000		
Washington:			
Collins, Hadley Lake			3,000
Hayes Pond			3,000
Easton, Silver Creek			10,000
Ellensburg, Applicant	50,000		
English, Lake Goodwin			15,000
Northport, Big Sheep Creek		15,000	
Deep Creek		15,000	
Deep Creek Lake		15,000	
Pepons Lake		15,000	
North Yakima, Bumping River	50,000		15,000
Rattlesnake Creek			20,000
Orient, Boulder Creek		7,500	
Port Angeles, Salt Creek			10,000
Republic, Granite Creek		7,500	
Long Lake		17,500	
O'Brien Creek		10,000	
Swan Lake		7,500	
Trout Creek		7,500	
Snoqualmie, applicant	100,000		
Tacoma, Tanwax Creek			20,000
Wall, State fish commission	400,000		
Wyoming:			
Beulah, Sand Creek			4,000
Big Sandy, Big Sandy River			31,200
Centennial, Gap Lake			15,000
Sand Lake			10,500
Sheep Lake			10,500
Clearmont, Cloud Peak Lake			10,000
Crazywoman Creek, North Fork			12,000
Long Lake			6,000
Ringbone Lake			6,000
Romeo Lake			4,000
Seven Brothers Lake			6,000
Sherd Lake			6,009
Cody, Chain of Lakes		4,500	
Crazy Creek		6,750	

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wyoming—Continued.			
Cody, Little Rocky Creek		11,250	
Shoshone River, North Fork		13,500	
Shoshone River, South Fork		13,500	
Wood River, North Fork		11,250	
Wood River, South Fork		6,750	
Dubois, Big Wind River, East Fork			6,000
DuNoir River, West Fork			6,000
Lake of the Woods			12,000
Pelham Lake			12,000
Encampment, Encampment Creek, North Fork			5,900
Miner Creek, South Fork			9,500
Grey Bull, Beaver Creek		6,750	
Cedar Creek		6,750	
Shell Creek		13,500	
Willett Creek		6,750	
Lander, Bull Lake Creek			12,000
Chimney Lake			20,000
Clear Creek			10,000
Dinwoodie Creek			11,900
Trout Creek			8,000
Washakie Creek			10,000
Laramie, State fish commission	700,000		
Manderson, Buckskin Ed Creek		4,500	
Medicine Lodge Creek		11,250	
Paint Rock Creek, South Fork		6,750	
Upper Shell Creek		6,750	
Pinedale, Boulder Creek			18,000
Burnt Lake			18,000
Ranchester, Little Horn Creek			14,000
Porcupine Creek			12,000
Saw Mill Creek			4,000
Tongue River, South Fork			12,000
Walker Creek			4,000
Weston Creek			4,000
Wolf Creek			16,000
Riverton, Bear Creek			6,500
Big Wind River, West Fork			10,000
Burroughs Creek			6,500
Six Mile Creek			8,000
Sundance, Medicine Creek			9,600
Thermopolis, Big Horn River		13,500	
Wind River, Little Wind River, North Fork			6,000
Little Wind River, South Fork			6,000
Meadow Creek			6,000
Willow Creek			6,000
Yellowstone, Boat House Creek		40,000	
Clear Creek		75,000	
Columbine Creek		50,000	
Cub Creek		75,000	
Hatchery Creek		50,000	
Natural Bridge Creek		50,000	
Pelican Creek		75,000	
Sylvan Lake		80,000	
Tower Creek		25,000	
Yellowstone River		90,000	
Total [a]	3,435,000	1,939,250	4,784,067

LOCH LEVEN TROUT.

Disposition.	Fingerlings.
South Dakota:	
Rapid City, Barker Pond	5,000
Roubaix, Elk Creek	15,000
Savoy, Little Spearfish Creek	10,000
Spearfish, Crow Creek	10,000
Wyoming:	
Saratoga, North Platte River	8,000
Total	48,000

[a] Lost in transit, 9,900 fingerlings.

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LAKE TROUT.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Iowa:			
Manchester, Maquoketa River			23
Maine:			
Abbot Village, Buttermilk Pond		5,000	
Enfield, State fish commission	50,000		
Farmington, Clear Water Lake		9,500	
Harrington, Schoodic Pond		10,000	
Locke Mills, Round Lake		5,000	
South Pond		5,000	
Nicolin, Branch Pond		15,000	
Norway, Lake Kewayden		10,000	
Otis, Great Brook		18,723	
Pembroke, Pennamaquan Lake		12,000	
Michigan:			
Baraga, Lake Superior		625,000	
Beaver Island Harbor, Lake Michigan		900,000	
Big Rock Reef, Lake Michigan		2,370,000	
Charlevoix Reef, Lake Michigan		3,400,000	
Detour, Lake Huron		1,000,000	
Escanaba, Lake Michigan		150,000	
Fishermens Home, Lake Superior			647,000
Fishermens Island, Lake Michigan		2,600,000	
Fish Island, Lake Superior			525,500
Greenville, Ziegenfuss Lake		30,000	
Light House, St. Marys River		200,000	
Long Point, Lake Superior		1,250,000	
McCargoes Cove, Lake Superior		600,000	
Manistique, Lake Michigan		150,000	
Marquette, Lake Superior		500,000	
Munising, Lake Superior		600,000	
Nine Mile Point, Lake Michigan		800,000	
North Point, Lake Huron		1,750,000	
Ontanagon, Lake Superior		625,000	
Paris, State fish commission	3,000,000		
Rock Harbor, Lake Superior		900,000	
Scarecrow Island, Lake Huron		1,750,000	
Skilligallee Reef, Lake Michigan		900,000	
Tobens Harbor, Lake Superior		900,000	
Todds Harbor, Lake Superior		600,000	
Washington Harbor, Lake Superior		775,000	1,037,500
Whitefish Bay, Lake Superior		2,000,000	
Wrights Island, Lake Superior			600,000
Minnesota:			
Beaver Bay, Lake Superior		250,000	
Clearbrook, Deep Lake			25,000
Duluth, Lake Superior			80,000
State fish commission		100,000	
French River, Lake Superior		500,000	
Grand Marais, Lake Superior		500,000	
Grand Portage, Lake Superior		250,000	
Knife River, Lake Superior		500,000	
Sartell, Neargarten Lake			25,000
Standard Rock, Lake Superior		250,000	
Sucker River, Lake Superior		500,000	
Two Harbors, Lake Superior		500,000	
Montana:			
Bozeman, State fish commission			5,000
New Hampshire:			
Bristol, Newfound Lake		1,500	
Enfield, Mascoma Lake		1,000	1,950
Lebanon, Crystal Lake		1,000	1,000
West Swanzey, Swanzey Lake		1,000	
New Jersey:			
Branchville, Owassa Lake		20,000	
New York:			
Bath, State fish commission	100,000		
Charity Shoals, Lake Ontario		350,000	
Fox Island, Lake Ontario		849,000	
Fuller Bay, Lake Ontario		350,000	
Galloo Island, Lake Ontario		300,000	
Grenadier Island, Lake Ontario		1,220,000	
Hayes Point, Lake Ontario		350,000	
Long Lake West, Loon Pond	25,000		
North Creek, Clear Pond		12,000	
Thirteenth Lake		12,000	
Northville, Sacandaga Lake			500
Point Peninsula, Lake Ontario		600,000	
Port Henry, Lincoln Pond		20,000	

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LAKE TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New York—Continued.			
Port Jervis, Bauers Lake		12,000	
Raquette Lake, Sagamore Lake	25,000		
Stony Island, Lake Ontario		280,000	
Stony Point, Lake Ontario		750,000	
Ohio:			
Kellys Island, Lake Erie		350,000	
Oregon:			
Clackamas, Crystal Lake			871
Pennsylvania:			
Pleasant Mount, State fish commission	100,000		
South Dakota:			
Fruitdale, U. S. Reclamation Reservoir			17,280
Webster, Pickerel Lake			400
Vermont:			
Barnet, Harvey Lake			1,000
Barton, Clarke Pond			2,000
May Pond			3,000
Bethel, Silver Lake			2,000
Canaan, Big Averill Lake			7,500
Greensboro, Caspian Lake			900
Middlebury, Lake Dunmore			9,246
Norton Mills, Big Averill Lake			3,375
Orleans, Long Pond			15,200
Willoughby Lake			3,000
Roxbury, State fish commission	200,000		
Washington:			
Loon Lake, Deer Lake			6,000
Loon Lake			6,000
Renton, Swan Lake			4,500
Tacoma, American Lake			12,000
Wisconsin:			
Brule River, Lake Superior		500,000	
Madison, State fish commission	9,200,000		
Port Wing, Lake Superior		500,000	
State Line, Anderson Lake			20,000
Black Oak Lake			30,000
Wyoming:			
Lander, Bonneville Lake			300
Frye Lake			200
Granite Lake			200
Moss Lake			300
Sheridan, Big Horn River	100,000		
State fish commission	50,000		
Total[a]	12,850,000	35,294,723	3,093,745

BROOK TROUT.

Arizona:			
Holbrook, Little Colorado River			2,500
Arkansas:			
Hot Springs, Gulpha Creek			892
California:			
Sisson, State fish commission	100,000		
Truckee, Carpenter Creek			3,000
Fuer Creek			3,000
Hot Springs Creek			3,000
Juniper Creek			5,000
Union Mills Creek			5,000
Colorado:			
Antero, Antero Reservoir			25,000
Sotuh Platte River			30,000
Aspen, Stillwater Run		15,000	
Taylor Lake		25,000	
Basalt, Lucksinger's pond		10,000	
Beaver Junction, Lake McNeil		40,000	
Biglow, Frying Pan River, North Fork			10,000
Boulder, Duck Lake		25,000	
Jim Creek		25,000	
Left Hand Creek			21,000
Middle Boulder Creek			24,000
Nederland Lake			25,000
North Boulder Creek		15,000	

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[a] Lost in transit, 500 fry and 1,625 fingerlings.

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado—Continued.			
Boulder, Smith's pond			50,000
South Boulder Creek		25,000	
South St. Vrain Creek		15,000	
Buffalo, Buffalo Creek			15,000
Platte River			17,000
Wellington Lake			120,000
Buffers Spur, Fremont Lake		10,000	
Cardinal, Devlin Creek		15,000	
Cascade, Heizer Lake			5,000
Cathers Springs, Little Fountain River			16,000
Cliff, Platte River			30,000
Colorado Springs, Bide-A-Wee Trout Pond			3,000
Pring Pond		12,000	
State fish commission			25,000
Creede, Miners Creek			15,000
Rio Grande River			15,000
Shallow Creek			15,000
De Beque, Carr Creek			10,000
Delta, Gunnison River			25,000
Roubedeaux River			20,000
Trickel Lake		20,000	
Denver, Bear Creek			42,000
Durango, Junction Creek			20,000
Eldora, Eldora Lake		30,000	30,000
Estabrook, Craig Creek			10,000
Platte River			9,000
Foxton, South Platte River			5,000
Granby, Fern Lake			30,000
Fish Creek			15,000
Grand Lake			10,000
Soda Creek			6,000
Spirit Lake			30,000
Supply Creek			20,000
Granite, Lower Twin Lake			15,000
Twin Lakes			20,000
Grant, Geneva Lake			10,000
Platte River			9,000
Platte River, South Fork			50,000
South Platte River			3,000
Green Mountain, Falls Catamount Creek		25,000	
Idaho Springs, Chicago Creek		27,000	
Chinns Lake		24,000	20,000
Fall River			12,500
Lake Edith			35,000
Sherwins Lake		15,000	
Ivanhoe, Morman Lake			10,000
Leadville, Arkansas River, Lower			20,000
Arkansas River, Upper			20,000
Big Union Creek			5,000
Crystal Lake			15,000
Dwyer's pond			5,000
Half Moon Creek			30,000
Lake Creek, Lower			25,000
Lake Creek, Upper		12,000	20,000
Musgrove Lakes		400,000	
Smith Ponds		54,000	
State fish commission			25,000
Tennessee River			20,000
Turquoise Lake		175,000	55,000
Loveland, Cub Lake			8,000
Lyons, Copeland Lake			6,500
St. Vrain River, Middle Fork			25,000
Thunder Lake			15,000
Malta, Arkansas River			30,000
Half Moon Creek			15,000
Lake Creek			25,000
Lake Creek, North Fork			15,000
Tennessee Creek			10,000
Nast, Frying Pan River			20,000
Norrie Koch Lake			10,000
Mill Creek			1,000
Platte Canon, South Platte River			15,000
Ranch Creek, Ranch Creek			3,000
Rockwood, Cascade Creek			30,000
Rollinsville, Barker Lake		30,000	
Salida, Arkansas River			5,500
Sellar, Sellar Lake			10,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Colorado—Continued.			
Shawnee, South Platte River			7,500
Singleton, South Platte River			4,500
South Fork, Rio Grande, South Fork			24,800
Steamboat Springs, Bivens Lake			16,500
Mad Creek			7,000
Tabernash, Fraser River			6,000
Thomasville, Engelbrecht Lakes			411,000
Lake Howard		5,000	
Lime Creek			10,000
Vasquez, Vasquez Creek			4,500
Victor, Bison Park Lake			30,000
Virginia Dale, Fish Creek			20,000
Webster, South Platte River			10,000
Wolcott, Eagle River			20,000
Woodland Park, Beaver Lake (A)			6,400
Beaver Lake (B)			6,400
Beaver Lake (C)			4,000
Hay Creek, Branch of			10,000
Hay Creek, Lower			3,200
Northfield Lake			48,000
Trout Creek			6,400
Upper Beaver Creek and tributaries			5,600
Woodland Park Lakes		15,000	
Yampa, Lost Lake			18,000
Connecticut:			
Bloomfield, Griffin Brook		6,000	
Silver Brook		4,000	
Westside Brook		4,000	
Bristol, Stafford Creek		4,950	
Clarks Corner, Trout Pond		3,000	
Collinsville, Cherry Brook		9,800	
Hartford, Broad Brook		3,000	
Salmon Brook		4,000	
Meriden, De Bichopp Brook		4,000	
Pipesdale Brook and tributaries		6,000	
New London, Brandegee Aquarium			15
Rockville, Meachams Brook		3,500	
Simsbury, McLean's pond			2,000
Nod Brook		8,000	
South Norwalk, Barnum Brook		2,000	
Barrett Brook		2,000	
Calvin Brook		2,000	
Comstock Brook		2,000	
South Norwalk, Saugatuck River, West Branch		4,000	
Silver Lake		1,000	
West Norwalk Brook		4,000	
Weston River		10,000	
Tariffville, Cullman Brook		2,000	
Salmon Brook, West Branch		4,950	
Unionville, Aardmaer Brook		2,000	
Spring Pond		2,000	
Waterbury, Hop Brook		8,000	
Mad River		10,000	
Georgia:			
Mountain City, Slecook Creek			4,000
Nacoochee, Cantrell Creek			4,000
Elder Creek			3,000
Kane Creek			4,000
Long Branch Creek			4,000
Pigeon Creek			5,000
Turnerville, Roland Creek			3,000
Idaho:			
Albany Falls, Thompson's pond			125
Black Lake, Black Lake Creek			250
Enaville, Babbendorf Creek			300
Leonia, East Boulder Creek			900
Mullan, Cottage Ranch Creek			300
Pebble, Pebble Creek			1,400
Port Neuf River			2,975
Tekoa, Benewah Creek			750
Victor, Cherry Lake			900
Fall Creek			1,375
Illinois:			
Spring Grove, Hatchery Brook			525
Indiana:			
Bloomfield, Bridge Creek			800
Clifty Creek			800

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Iowa:			
Earlville, Penn Creek			2,000
Hancock, Nishne Batua River			8,250
Iowa Falls, Elk Run Creek			800
Lansing, Village Creek			1,600
North McGregor, Bass Creek			200
Bloody Run			300
Mill Pond Creek			300
Sny Magill Creek			300
Peosta, Melleray Park Pond			100
Postville, Heckers Branch			300
Kentucky:			
Viper, Masons Creek			4,000
Maine:			
Attean, Attean Lake		10,000	
Barrett Pond		10,000	
Beaver Pond		10,000	
Bog Brook		5,000	
Clear Water Pond		10,000	
Deer Pond		10,000	
Fish Pond		10,000	
Grace Pond		10,000	
Holeb Lake		10,000	
Indian Pond		10,000	
Lowell Pond		10,000	
Moose Pond		10,000	
Thompson Brook		5,000	
Three Streams		5,000	
Belfast, Dead Brook		2,000	
Goose River		5,000	
Hurds Brook		5,000	
Kimball Brook		5,000	
McKinley Brook		5,000	
Biddeford, Batson River		8,000	
Cascade Brook		8,000	
Deep Brook		8,000	
Goose Fair Brook		12,000	
Ricker Brook		8,000	
Sandy Brook		8,000	
Towles Brook		8,000	
Wyman Brook		8,000	
Bigelow, Horns Pond		9,000	
Mount Bigelow Pond		15,000	
Mud Pond		15,000	
Upper Dam Pond		15,000	
Bingham, Bean Pond		21,000	
Nicolls Bog		30,000	
Rowe Pond		15,000	
Bryant Pond, Lake Christopher		20,000	
Carrabassett, West Carry Pond			1,500
Dedham, Manns Brook		60,000	
Dennysville, Cathance Lake		30,000	
Dexter, Wassookeag Lake		25,000	
East Orland, Craig Pond		15,000	
Heart Pond		31,408	
Patten Pond		15,000	
Toddy Pond		20,000	
Upper Patten Pond		15,000	
Ellsworth, Branch Pond		100,000	
Enfield, Trout Pond		25,000	
Franklin, Molasses Pond		30,000	
Holden, Hatcase Pond		30,000	
Holeb, Beaver Pond		15,000	
Round Pond		12,000	
Jackman, Benjamin Pond		10,000	
Gander Brook		5,000	
Lake Wood		10,000	
Little Wood Pond		10,000	
Mud Pond		10,000	
Spy Pond		10,000	
Wood Creek		5,000	
Kineo, Spencer Brook		12,000	
Machias, Bog Lake		30,000	
Mapleton, Presque Isle River, North Branch		6,000	
Masardis, Millnockett Lake		15,000	
Monmouth, Purgatory Pond		15,000	
Sand Pond		15,000	
State fish commission	100,000		

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Maine—Continued.			
Norway, Allen Pond		28,000	
Goodwin Brook		12,000	
Hannah Brook		12,000	
Hoobs Brook		20,000	
Virginia Lake		28,000	2,000
Otis, Green Lake		32,155	
Patten, Davis Pond		20,000	
Phillips, Bigelow Pond		21,000	
Carlton Pond		9,000	
Spring Lake		24,000	
Tuft Pond		21,000	
Phillips Lake, Phillips Lake		30,000	
Portland, Beaver Brook		3,000	
Duck Pond Brook		5,000	
Harvey Brook		3,000	
Little River, headwaters		5,000	
Nonesuch River, headwaters		6,000	
Red Brook, headwaters		4,000	
Princeton, Grand Lake		30,000	
Rumford, Howard Lake		24,000	
Schoodic, Schoodic Lake		30,000	
Skowhegan, Lake Weserunsett		27,000	
South Newcastle, Spring Hill Farm Brook		12,000	
South Paris, Abbott Pond		16,000	
Concord River		16,000	
Twenty Mile River		16,000	
Washburn Pond		12,000	
Springvale, Littlefield Pond		16,000	
Strong, Mount Blue Pond			1,000
Toothaker Pond			1,000
Walkers Siding Squa Pan Creek		8,000	
Waterville, Britton Lake		15,000	
West Ellsworth, Patten Pond		75,000	
Maryland:			
Baltimore, Dippengpound Brook			900
North Run			900
Bladensburg, Mattapom Creek			1,250
Empire, Elk Lick Run			3,000
Frederick, Piney Brook			300
Schaffer's pond			300
Glyndon, Old Mill Run			300
Kitzmiller, Laurel Run, North and South Forks			6,000
Lost Land Run, North and South Forks			6,000
Short Run			5,000
Three Fork Run			5,000
Wolf Den Run			5,000
Loch Haven, Butchers Run			300
Monkton, Verdant Valley Run			300
Oakland, Lake Beulah			2,000
Riderwood, Roland Run and tributaries			600
Selbysport, Cove Run			3,000
Mill Run			4,000
Swanton, Casselman Run			4,000
Crooked Run			2,000
Green Creek			3,000
Rocky Run			2,000
Wiley's pond			1,000
Thurmont, Big Hunting Creek			1,200
Tuscarora, Tuscarora Creek			900
Massachusetts:			
Andover, Great Brook		6,000	
Athol, Rutland Brook		2,000	
Baldwinsville, Norcross Pond		4,000	
Cambridge, applicant	1,950		
Gloucester, Alewife Brook		5,000	
Graniteville, Carkins Brook		2,000	
Leominster, Bartletts Brook		1,000	
Steam Mill Brook		3,000	
Wekepeke Brook		4,000	
Milton, Bailey Pond		1,000	
North Dana, Silver Brook Pond		5,000	
North Grafton, Kitwell Brook		2,000	
Quinsigammond River		2,000	
Palmer, Twelve Mile Brook			600
Saundersville, Coldspring Brook			400
Springfield, Powder Mill Brook	20,000		
Still River, Cumberry Pond		5,000	
West Brimfield, Quaboag River			1,200

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Massachusetts—Continued.			
Worcester, Ball Brook		8,000	
Chapin Brook		5,000	
Dart Brook		4,000	
Five Mile River		8,000	
Lake Quinsigammond			1,000
Mad Brook		6,000	
North Woods Brook		5,000	
Old South Brook		5,000	
Poor Farm Brook		4,000	
Quinapexet River		8,000	
Shaw Brook		4,000	
Tannery Brook		5,000	
Tide Brook		5,000	
Michigan:			
Allyn, Platte River			5,000
Alto, Whitneyville Creek		10,000	
Baldwin, Baldwin Creek		40,000	
Battle Creek, Ellis Brook		5,000	
Bellaire, Shanty Creek			3,000
Bessemer, Jackson Creek			5,000
Meyers Creek			4,000
Black River, Black River		20,000	
Branch, Weldon Creek		25,000	
Buchana, Crooked Brook			8,000
Charlevoix, Hortons Creek		15,000	
Monroe Creek		25,000	
Strovers Creek		5,000	
Copemish, Betsey River		10,000	
East Tawas, Cold Creek		20,000	
Guiley Creek		30,000	
Silver Creek		30,000	
Farwell, Coldwater Creek		20,000	
Gaylord, Au Sable River		50,000	
Sturgeon River		50,000	
Greenville, Turk Lake Creek		10,000	
West Branch		10,000	
Harrietta, Slagel River		20,000	
Henry, Bear River			5,000
Indian River, Little Pigeon Creek		10,000	
Stoney Creek		10,000	
Ishpeming, Blue Lake			8,000
Escanaba River and tributaries			10,000
Escanaba River, West Branch			5,000
Green Creek			5,000
Long Lake			8,000
Jackson, Wolf Creek		5,000	
Lucas, Clam River		10,000	
McBain, Clam River		10,000	
Marenisco, Alder Creek			3,000
Bear Creek			3,000
Beaver Creek			3,000
Clover Creek			3,000
Fox Creek			3,000
Honeymoon Creek			3,000
Kimble Creek			3,000
Little Presque Isle River			8,000
Marshall Creek			4,000
Nelsons Creek			4,000
Nine Mile Creek			3,000
Pigeon Creek			3,000
Ryans Brook			2,000
Marion, Clam River		10,000	
Mayfield, Boardman River		50,000	5,000
Muskegon, Cedar Creek		10,000	
Duck Creek		10,000	
Green Creek		10,000	
Newaygo, Pennoyer Creek		15,000	
Nirvanna, Sanburn Creek		20,000	
Orion, Hummers Creek		5,000	
Shadbolt Creek		5,000	
Oxford, Cold Spring Creek		10,000	
Deming Creek		10,000	
Hummers Creek		5,000	
Paint Creek		10,000	
Thurston Creek			3,000
Peacock, Big Sable River		15,000	

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Michigan—Continued.			
Ravenna, Mosquito Creek		10,000	
Roscommon, Au Sable River		15,000	
South Branch, Thompson Creek		5,000	
Sullivan, Norris Creek		10,000	
Temple, Gisawash Creek		10,000	
Green Creek		10,000	
Thompsonville, Betsey River		20,000	
Tobins Harbor, Tobin Bay			10,000
Walton Junction, Manistee River		50,000	
Washington Harbor, Grace Creek			4,000
Lake Dessor			10,000
Little Siskiwit Creek			6,000
Little Todds Creek			4,000
Siskiwit River			4,000
Minnesota:			
Caledonia, Badger Creek			165
Crooked Creek			165
Crystal Valley Creek			165
Dexter Creek			165
East Beaver Creek			165
Eastcott Creek			165
Irish Creek			165
Riceford Creek			165
South Fork Creek			165
Thompson Creek			165
West Beaver Creek			165
Wildcat Creek			165
Winnebago Creek			165
Carlton, Black Hoof River			8,000
Chatfield, Bear Creek			165
Carson Creek			165
Keeler Creek			165
Lynch Creek			165
Mill Creek			165
Shady Creek			165
Trout Run			165
Williams Creek			165
Clifton, Talmage Creek			6,000
Cushing, Little Elk Creek			8,000
Duluth, Amity Creek, West Branch			4,000
Beaverdam Creek			2,000
Lester River			6,000
Etna, Etna Creek			400
Harmony, Camp Creek			165
Hopkins, Purgatory Creek			1,600
Hovland, Linnell Creek			6,000
Knife River, Baptism Creek			4,000
Beaver Creek			4,000
Gooseberry Creek			4,000
Knife River			4,000
Split Rock Creek			4,000
Temperance River			4,000
Lamoille, Big Trout Creek			165
Homer Valley Creek			165
Little Trout Creek			165
Pickwick Valley Creek			165
Richmond Valley Creek			165
Lewiston, Enterprise Creek			200
Fergerson Creek			200
Hemingway Creek			2,200
Pine Creek			3,400
Pine Creek, Fremont Branch			200
Whitewater River			2,000
Whitewater River, East Branch			2,000
Whitewater River, Middle Branch			200
Whitewater River, North Branch			2,400
Whitewater River, South Branch			2,200
Little Falls, Clough Creek			5,000
Rice Creek			5,000
Skunk Creek			8,000
Minnesota City, Browns Valley Creek			200
Deering Valley Creek			200
Rollingstone Valley Creek			200
Speltz Valley Creek			200
Whitman Valley Creek			200
Motley, Swan River			8,000
Pillager, Pillager Creek			3,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Minnesota—Continued.			
Plainview, Beaver Creek			495
East India Creek			165
Logan Branch			165
Long Creek			165
Middle Creek			165
West India Creek			165
Whitewater River, Middle Branch			165
Whitewater River, North Branch			165
Whitewater River, South Branch			165
Preston, Big Spring Creek			165
Camp Creek			165
Duschee Creek			165
Partridge Creek			165
Sugar Creek			165
Trout Run			165
Watson Creek			165
Willow Creek			165
Wisel Creek			165
Red Wing, Belle Creek			825
Hay Creek			825
Rushford, Daley Creek			165
Enterprise Creek			165
Ferguson Creek			165
Hemingway Creek			165
Mead Creek			165
Overland Creek			165
St. Charles, Campbells Branch			1,200
Carters Creek			1,200
Crows Creek			1,200
Demuths Creek			1,000
Halls Run			200
Hemingway Creek			1,200
Nicols Creek			1,200
O'Mearas Creek			1,200
Pettis Creek			2,200
Pine Creek			200
Rush Creek			200
Trout Run			200
Troy Creek			2,200
Whitewater River, Middle Branch			1,000
Whitewater River, North Branch			1,000
Whitewater River, South Branch			1,000
Spring Grove, Riceford Creek			165
Waterloo Creek			165
West Beaver Creek			165
Swan River, Hawkins Creek			5,000
Tamarack, Vanduse Creek			4,000
Utica, Johns Valley Creek			200
Rush Creek			200
Winona, Beach Valley Creek			200
Bear Creek			200
Beaver Creek			200
Cedar Creek			200
Chimney Rock Creek			200
Corey Valley Creek			200
Dakota Valley Creek			200
Doblesteim Valley Creek			200
East Burns Valley Creek			2,200
Espelding Valley Creek			200
Gilmore Valley Creek			2,000
Ginthers Valley Creek			200
Harvey Valley Creek			200
Hicks Valley Creek			200
Laufenberger Valley Creek			200
Money Creek			200
Morrison Valley Creek			200
Murray Valley Creek			200
Pine Creek			200
Pleasant Valley Creek			2,200
Rose Creek			200
Rupprecht Valley Creek			200
Straight Valley Creek			200
Trout Valley Creek			200
Vondraeck Valley Creek			200
West Burns Valley Creek			2,200
Wiscoy Valley Creek			200

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Montana:			
Alhambra, Warm Springs Creek			4,000
Anaconda, Rock Creek			1,200
Avon, Dog Creek			5,000
Belgrade, Baker Creek		5,000	
Benhardt Creek		5,000	1,000
Cowan Creek		5,000	
Dry Creek		7,500	
Foster Creek		5,000	
Kennedy Creek		5,000	
Middle Creek		10,000	
Pass Creek		5,000	
Reese Creek		10,000	
Ross Creek		7,500	
Smith Creek		5,000	
Spring Creek		5,000	
Springhill Creek		5,000	
Story Creek		5,000	
Thompson Creek		5,000	1,000
Trout Creek		5,000	
Bigtimber, Bigtimber Creek, South Fork			1,750
Boulder Creek			1,050
Boulder Creek, East Branch			24,000
Duck Creek			175
Medicine Bow Creek			1,750
Otter Creek, North Fork			1,750
Swamp Creek			9,000
Yellowstone River			15,000
Bozeman, Angel Creek		5,000	
Baker Creek		5,000	
Bostwick Creek			5,000
Camp Creek		5,000	
Carlin Creek		5,000	
Cockerel Creek		5,000	
Curtiss Creek		5,000	
Fish Creek		5,000	
Greek Creek			1,000
Heeb Creek		5,000	
Jackel Creek		5,000	
Kennedy Creek		5,000	
Lansing Creek		5,000	
Martin Creek			3,000
Middle Creek			450
Middle Spanish Creek			500
Nixon Creek			5,500
North Spanish Creek			1,000
Ole Olson Creek			1,000
Pasha Creek			3,000
Smith Creek		5,000	
South Cottonwood Creek			1,000
South Spanish Creek			1,000
Specimen Creek			1,000
Squaw Creek			1,000
Story Creek		5,000	
Stuckey Creek			3,000
Thompson Creek		5,000	
Tice Creek		5,000	
Twin Lake			450
Brisbin, Spring Creek			3,000
Broadus, Plumb Pond			3,000
Broadview, Spring Lake			1,500
Butte, Basin Creek			5,400
Bernisee Creek			5,400
Canyon Creek			9,000
Fish Creek			5,000
Lost Creek			5,000
Moose Creek			5,000
Race Track Creek			9,000
Rock Creek			9,000
Wise River			9,000
Cardwell, Davidson's pond			600
Chadbourn, Bang Tail, Creek		12,500	
Guild River			16,000
Clancy, Little Prickly Pear Creek			450
Clyde Park, Cottonwood Creek		27,500	
Rock Creek			20,000
Columbus, Rosebud Creek			450

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Montana—Continued.			
Corwin Springs, Cutler Lake			1,350
Crow Agency, Corral Creek			300
De Borgia, Big Creek			7,200
Deer Creek			5,400
East Twin Creek			3,600
St. Regis River			7,200
Savanac Creek			5,400
Timber Creek			5,400
Twelve Mile Creek			7,200
West Twin Creek			5,400
Deer Lodge, Race Track Creek			12,500
Dell, Basin Creek			2,000
Coyote Creek			2,000
Little Sheep Creek			3,000
Red Rock River			4,000
Dillon, Van Camp Creek			750
Dodson, Lodge Pole Creek			900
Drummond, Boulder River			7.000
Glacier Park, Oke Lake			3,000
Two Medicine Lake			3,000
Two Medicine Lake, Upper			3,000
Grass Range, Beaver Ball Creek			600
Hamilton, Bitter Root River			2,875
Bitter Root River, East Fork			600
Bitter Root River, West Fork			600
Blodgett Creek			600
Girds Creek			300
Lost Horse Creek			600
Roaring Lion Creek			300
Rock Creek			300
Saw Tooth Creek			300
Skalkaho Creek			600
Sleeping Child Creek			300
Tin Cup Creek			300
Harlowton, Meagher County Streams			3,900
Helena, Big Blackfoot River			11,500
Hobson, Judith River, headwaters			900
Homestake, Railway Pond			3,750
Huson, Marion Creek			900
Jefferson City, Sinnott's pond			525
Josephine, Sixteen Mile Creek			2,100
Kalispell, Blaine Creek			600
Doll's lake			300
Lost Creek			600
Mill Creek			600
Spring Creek			600
Truman Creek			600
Upper Ashley Creek			1,200
Lewistown, Armels Creek, East Fork			600
Box Elder Creek, East Fork		5,000	
Brush Creek		10,000	
Casino Creek		12,500	
Kelly's pond			150
McDonald Creek, North Fork		17,500	
Wolverine Creek		7,500	
Wolverine Pond		7,500	
Libby, Bobtail Creek			600
Cedar Lake			1,225
Fisher River			4,000
Leigh Lake			2,000
Rainy Creek			600
Livingston, Brisbin Creek		5,000	
Fleshman Creek			875
Ford Creek			700
Holliday Spring Creek			875
Larsin Creek		5,000	
Meredith Creek Pond			875
Mortimer Creek		7,500	
Spring Creek		2,500	
Summerland Creek			4,500
Yellowstone River			3,500
Mandlow, Sixteen Mile Creek			1,500
Manhattan, Baker Creek		15,000	
Ellingsen's pond		2,500	
Gibson Creek		15,000	
McAlland Creek		10,000	
Stony Creek		15,000	

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Montana—Continued.			
Martinsdale, Loco Creek			1,000
Lyon Creek			13,500
Musselshell River			2,000
Spring Creek			13,500
Missoula, Bitter Root River			2,450
Clarks Fork Creek			2,100
Moore, Rock Creek, tributary of			900
Nimrod, Allison's pond			2,000
Norris, Meadow Creek			53,000
Rimini, Ten Mile Creek			1,200
Spire Rock, Pipestone Reservoir			6,000
Springdale, Cold Spring Creek			4,500
Kelly Creek		17,500	
Stevensville, Bitter Root River			14,000
Mill Creek			2,275
Stryker, Alpine Lake	25,000		
Dowdles Pond			300
Spring Creek			300
Superior, Cliff Lake			750
Dyomond Lake			700
Toston, Crow Creek			7,000
Tregloan, Spring Creek		5,000	
Two Dot, Big Elk Lake			900
Wilsall, Horse Creek, Upper			16,000
Nebraska:			
Chadron, Little Bordeaux Creek			10,000
Trunk Butte Creek			10,000
Gordon, Laraby Creek			10,000
White Clay Creek			10,000
Nevada:			
Verdi, State fish commission	50,000		
New Hampshire:			
Alstead, Colwell Pond		6,000	
Bartlett, Saco River		15,000	
Berlin, Jericho Brook			5,000
Bristol, Blake Brook		3,000	
Danforth Brook		3,000	
Dick Brown Brook		3,000	
Fowler River		5,000	
George Brook		3,000	
Hemlock Brook		3,000	
Patten Brook		4,000	
Smith River		8,000	
Taylor Brook		4,000	
Canaan, Blake Brook		3,000	
Fairweather Brook		3,000	
Indian River		5,000	
Orange Brook		4,000	
Orange Pond		7,000	
Colebrook, Clear Creek			6,000
Conway, State fish commission	30,000		
Derry, Beaver Lake		12,000	
Durham, Hoitt Brook		2,000	
Franklin, Call Brook		2,000	
Mountain Brook		4,000	
Putney Brook		3,000	
Groveton, Keene Bog Pond			5,000
Whitcomb Mountain Pond			5,000
Hill, Main Brook		5,000	
Lebanon, Bicknell Brook		3,000	
Cold Pond		9,000	
Littleton, Glover Pond			1,500
Manchester, Bog Brook		4,000	
Bowman Brook			300
Cochran Brook		4,000	
Cohas Brook		3,000	
Colby Brook			300
Cold Spring Brook			200
Cold Stream Brook		6,000	
Dalton Brook			400
Darrah Brook			400
Dumpling Brook			200
Kider Brook			200
Leaches Brook		2,000	
Mead Brook			400
Menter Brook			400
Millstone Brook		3,000	
Mountain Brook		3,000	200

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New Hampshire—Continued.			
Manchester, Nigger Brook			200
Patten Brook		3,000	200
Peters Brook			300
Pierce Brook		2,000	
Prescott Brook			200
Ray Brook			200
Reed Brook			200
Steep Pitch Pond			300
Watts Brook			700
Whitin Brook		2,000	
Wiggin Brook			200
Milford, Baldwin Brook		3,000	
Cold Brook		3,000	
Scabbard Brook		3,000	
Trow Brook		2,000	
Nashua, Cider Mill Brook			300
Duncklee Brook		2,000	
Hassell Brook			200
Hill Brook		2,000	
John Howe Brook		2,000	
Lydia Reed Brook			200
Muddy Brook		3,000	
Peacock Brook		2,000	400
Silver Spring Brook			200
Tandy Brook		3,000	
Witch Brook		6,000	
Norwich, Hughes Brook		9,000	
Mink Brook		4,000	
Oliverian, Oliverian Brook and tributaries		10,000	
Percy, Christine Lake			800
Petersborough, Wilder Brook		4,000	
Pike, Lake Katherine		10,000	
Plymouth, Elbow Pond		6,000	
Ponemah, Peacock Brook		1,000	
Portsmouth, Peverley Brook		2,000	
Potter Place, Cole Pond			600
Raymond, Dudley Brook		3,000	
Fordway Brook		3,000	
South Brookline, Rockwoods Pond		2,000	
Scabbard Mill Brook			200
Wallace Brook		5,000	
Warner, French Brook		3,000	
Lake Ninnepocket		10,000	
Meadow Brook		3,000	
Osgood Brook		2,000	
Silver Brook		2,000	
Stevens Brook		6,000	
Wilton, Hickory Brook		1,000	
New Jersey:			
Bloomfield, Lindermeyer Pond			300
Spring Brook			900
Thompson Pond			300
Butler, Pequannock River			600
Chatsworth, White Horse Pond			600
Morristown, Ravenswood Brook			900
Ridgewood, Wykoff Brook			900
Whippany, Badgley Brook			600
New Mexico:			
Chama, Brazos River			10,400
Canionis River			10,400
Chama River			20,000
Cimarron, Rayado River			10,000
Costilla, Costilla River			10,400
Des Moines, Spring Hill Pond			1,000
Dexter, Lake Van			2,000
Folsom, Trinchenta Creek			10,000
Glorietta, Jacks Creek			7,500
Pecos River			22,500
Hagerman, Railway Reservoir			1,000
Onava, Sapello River			10,000
Raton, Sugarite River			10,000
San Antonio, Torreon Spring Pond			1,000
San Marcial, Nogal Creek			5,000
Santa Fe, Nambe River			5,000
Santa Fe River			15,000
Servilleta, Des Montes Pond			1,000
Fernandez de Taos River			14,500
Little Rio Grande River			12,500
Pueblo River			12,500

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New Mexico—Continued.			
Silver City, Mineral Creek			10,000
Ute Park, Red River			30,000
Wagon Mound, Tyson Spring Creek			3,000
New York:			
Afton, Bump Creek		10,000	
Kelsey Creek		10,000	
Ardsley, Saw Mill Creek		10,000	
Arena, Forest Lake			500
Benson Mines, Black Creek		5,000	
Ellis Creek		5,000	
Little River		10,000	
Marshalls Creek		5,000	
Tamarack Creek		10,000	
Twin Lakes		20,000	
Big Indian, Big Indian Creek		10,000	
Bushnellville Creek		5,000	
Neversink Creek, East Branch		5,000	
Neversink Creek, West Branch		5,000	
Booneville, Mill Creek		5,000	
Calcium, West Creek		10,000	
Cold Brook, Ketchum Hollow Creek		5,000	
Maltby Hollow Creek		5,000	
Croghan, Desert Creek		5,000	
Fish Creek		5,000	
Trout Brook		5,000	
East Worcester, Charlotte River		15,000	
Ellenville, Chestnut Creek		10,000	
Rondout Creek		10,000	
Vernooy Kill Creek		5,000	
Evans Mills, Lawton Creek		5,000	
Loadwick Creek		5,000	
Pleasant Creek		5,000	
West Creek		5,000	
Wilson Creek		5,000	
Felts Mills, Felts Mills Creek		15,000	
Frenches Creek		4,000	
Johnson Branch		5,000	
King Branch		4,000	
Greene, Crandall Brook		5,000	
Geneganslete Creek		15,000	
Wheeler Brook		5,000	
Groton, Owasco Lake, inlets of		6,000	
Hornell, Canisteo River		20,000	
Car Valley Creek		5,000	
Crittenden Creek		5,000	
Grays Brook		5,000	
Griswold Brook		5,000	
McHenry Valley Creek		5,000	
Rockwell Brook		5,000	
Seeley Creek		10,000	
Seeley Creek, North Branch		5,000	
Stevens Brook		5,000	
Whitney Valley Creek		5,000	
Hunter, Batavia Kill Creek		15,000	
Kasoag, Indian Camp Brook		5,000	
McConnell Brook		5,000	
Pine Bog Brook		5,000	
Kerhonkson, Rochester Creek		10,000	
Kingston, Coxing Kill Creek		8,000	
Shawangunk Kill Creek		8,000	
Stony Creek		8,000	
Veerkeerder Kill Creek		5,000	
Lake Mahopac, Blount Brook		10,000	
Village Brook		10,000	
Lacona, Mad River		20,000	
Livingston Manor, Willowemoc River		25,000	
Lyons, Ackerman Brook		6,000	
Draper Brook		10,000	
Second Creek		6,000	
Trout Run		10,000	
Malone, Salmon River and tributaries			4,000
Mount Pleasant, Mink Hollow Creek		5,000	
New Scotland, Vlauman Kill Creek		15,000	
New York City, New York Aquarium	5,000		99
Oneonta, Otego Creek		10,000	
Otsdawa Creek		10,000	
Otsdawa Creek, East and West Branches		9,000	
Third Brook		4,000	

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New York—Continued.			
Otisville, Shawangunk Mountain Lake		10,000	
Phoenicia, Snyder Hollow Creek		5,000	
Stony Clove Creek		8,000	
Warnerskill Creek		5,000	
Pine Hill, Birch Creek		5,000	
Pleasant Lake, Buck Pond		15,000	
Longfellow Lake		20,000	
Port Henry, Sherman Brook		20,000	
Port Jervis, Black Brook			1,000
Mongaup Brook			1,000
Poughquag, Pleasant Ridge Run		3,000	
Preble, Tioughnioga River, headwaters		10,000	
St. Regis Falls, Ploof Brook		5,000	
Saugerties, Winston Pond		3,000	
Schenectady, Hungerkill Brook		15,000	
Schnevus, Schnevus Creek		15,000	
Seneca Falls, Canoga Creek		5,000	
Sherburne, Handsome Brook		10,000	
Standish, Upper Chateaugay Lake		10,000	
Suffern, Tallmans Brook			200
Syracuse, Conklin Brook			500
Elmwood Brook			600
Geddes Brook			600
Pools Brook			500
South Hollow Brook			500
Swamp Brook			500
Walden, Kline Kill Creek		20,000	
Shawangunk Kill Creek		20,000	
Watertown, Jacobs Creek			5,700
Wellsville, Honeoye Creek		10,000	
Whitehall, Cold Brook		3,000	
White Plains, Ridgelugh Pond		5,000	
Willsborough, Little Sky Pond		5,000	
Woodstock, Sawkill Creek		8,000	
North Carolina:			
Andrews, Jarrett Creek			4,000
Brevard, East Fork Creek, headwaters			3,000
Cherryfield, Weaver Creek			3,000
Crestmont, Baxters Creek			10,000
Edgemont, Gregg Creek			5,000
Lost Cove Creek			8,000
Rock House Creek			4,000
Elk Park, Dutch Creek			4,000
Hendersonville, Falling Brook			4,000
Horse Shoe, Queens Creek			4,000
Hudson, Gibson's pond			1,000
Lake Toxaway, Horse Pasture River			4,000
Minneapolis, Birchfield Creek			6,000
Montezuma, Boones Fork Creek			5,000
Kawana Lake			2,000
Mount Tabor, Spivey Mill Pond			3,300
North Wilkesboro, Cub Creek, Spring Branch			2,000
Dugger Creek			5,000
Laurel Creek			6,000
Laurel Creek, North Branch			5,000
Little Dugger Creek			4,000
Masters Branch			5,000
Pegs Branch			4,000
Reddies River, North Fork			10,000
Penrose, Laurel Creek, East Branch			5,000
Laurel Creek, Middle Branch			4,000
Laurel Creek, West Branch			4,000
Thomas Creek			9,000
Pensacola, Cat Tail Creek			9,000
Pineola, Upper Creek			6,000
Pisgah Forest, Sutton Creek			5,000
Pitts, Camp Creek			8,000
Roaring River, Mountain Run			2,000
Ronda, Bungalow Creek			2,000
Rosman, French Broad River, North Fork			5,000
Rural Hall, Snider's pond			2,000
Ohio:			
Garrettsville, Spring Brook			850
Stuart Creek			850
Lexington, Beverstock Run			400
Mansfield, Hales Run			2,000
Springville Brook			2,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Ohio—Continued.			
Mount Vernon, Delano Run			800
Schenks Creek			2,000
Plymouth, Huron River, South Branch			2,000
Ravenna, Cuyahoga River, tributary of			600
Urbana, Clear Creek			12,000
Oklahoma:			
Carrier, Jungle Lake			1,000
Oregon:			
Clackamas, Abernathy Creek			300
Canyon Creek			6,500
Crystal Lake			429
Salmon River			10,000
Oregon City, Bush's pond			1,600
Pennsylvania:			
Annville, Killingers Creek			250
Ansonia, Asaph Run			1,000
Bellefonte, Spring Creek			2,300
Bellnap, Martins Run			500
Birch, Birch Island Run			1,000
Bodine, Battle Run			500
Condon Hollow Run			300
Murray Run			300
Salt Run			500
Slack Run			500
Carlisle, Gongs Creek			375
Chambersburg, Birch Run			1,500
Carbaugh Run			2,000
Pine Run			1,500
Christiana, Evans Run			300
Clearfield, Big Trout Run			500
Cold Creek			500
Little Anderson Creek			500
Little Stony Run			500
Little Trout Run			500
Montgomery Creek			500
Moose Creek, Left Branch			500
Cogan Station, Big Sandy Creek			500
Hoagland Run			1,000
Wolf Run			1,000
Corbett, Susquehanna River, West Branch			1,500
Cross Fork, Kettle Creek, Cross Fork			1,500
Dunlo, Barefoot Run			1,000
Bobs Creek			1,000
Ebensburg, Cold Spring Run			500
Gettys Run			500
Illigs Run			500
James Run			500
Jones Run			500
McGarrs Run			500
Morris Jones Creek			500
Roberts Run			500
Rapid Run			500
Roaring Run			500
Williams Run			500
Eltonburg, Laurel Run			500
Essick, Black Stump Run			1,000
Horns Run			500
Kansas Run			1,000
Lake Run			500
Fleetwood, Willow Creek			1,000
Frugality, Laurel Run			1,000
Sandy Run			1,000
Galeton, Germania Creek			1,500
Kettle Creek			1,000
Kettle Creek, East Branch			1,500
Lyman Run			1,000
Glen Mawr, Rock Run			1,000
Hastings, Driscoll Run			1,000
Kuntaman Run			500
Moss Run			1,000
Platt Run			500
Rock Run			1,000
Rogue Harbor Run			1,000
Hazleton, Beck Pond			375
Kellers Run			375
Long Run			375

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Hazleton, Ringlabens Run			375
Spaulding Run			400
Hoadleys, Middle Creek			1,000
Wawgum Creek			1,000
Honesdale, Johnson Creek			1,000
Lackawaxen Creek			1,000
Howard, Marsh Creek			1,000
Huntingdon, Stony Creek, East Branch			1,500
Jersey Shore, Catfish Run			1,000
Gamble Run			500
Larrys Creek, First Fork			1,000
McElhatten Run			1,000
Lake Ariel, Five Mile Creek			800
Lancaster, Cromer Run			300
Herrs Brook			300
Hollingers Run			300
Myers Run			300
Lock Haven, Rands Run			500
Lykens, Clarks Creek			3,400
Rattling Creek			1,500
Mann, Graves's pond			300
Marietta, Clarke Run			600
Meyersdale, Big Pine Run			3,000
Little Pine Run			2,000
Meadow Run			2,000
Tub Mill Run			2,000
Milford, Deep Brook			1,000
Dwarf Kill Creek			1,000
Raymond Kill Creek			1,000
Steward Creek			400
Vandermark Brook			500
Mill Hall, Baker Run			1,000
Beech Creek			1,000
Benjamin Branch			500
Browns Run			500
Bull Run			500
Cedar Run			1,000
Chatham Run			1,000
Cherry Run			500
Duck Run			500
Fishing Creek			2,000
Hayes Run			500
Lamar Run			500
Little Fishing Creek			1,000
McElhatten Run			1,000
Plum Run			1,000
Queens Run			500
Scootac Run			1,000
Shoemaker Branch			500
Minersville, Black Creek			750
Buck Horn Creek			750
Buck Run			450
Dyers Run			750
Indian Run			750
Middle Creek			750
Sammys Run			750
Taylors Creek			750
Mount Union, Black Log Creek			250
Carters Run			250
Licking Creek			250
Lyons Gap Run			250
Old Womans Run			2,250
Scrub Gap Run			250
Singers Gap Run			250
Sugar Run			250
New Florence, Powder Mill Run			500
Tub Mill Run			500
New Philadelphia, Cold Run			250
Kunkles Pond			125
Merkles Pond			125
Rucks Pond			125
Schooks Pond			125
Silver Creek			125
Wildcat Run			250
Yosts Pond			125
North Bend, Bull Run			1,000
Laurelly Run			1,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Oil City, Horse Creek			1,000
Panther Run			1,000
Reese Run			1,000
Slate Run			1,000
Patton, Beaverdam Creek			2,000
Rock Run			500
Phillipsburg, Bushkill Creek			1,000
Picture Rocks, Bear Creek			500
Quarryville, Stewarts Run			300
Ralston, Abbotts Run			300
Acid Branch			500
Bear Trap Run			1,300
Buck Run			300
Frozen Run			500
Frozen Run, Left Fork			500
Frozen Run, Right Fork			400
Hat Run			300
Heylmun Run			300
Hounds Run			300
Long Run			500
Meadow Spring Run			300
Mill Creek			500
Miners Run			400
Moyer Gut Run			300
Pleasant Creek			500
Potash Run			500
Red Run			500
Red Run, Left Fork			300
Roaring Branch Creek			500
Rock Run			500
Rock Run, Right Fork			500
Short Run			200
Winslow Bolton Gut Run			200
Yellow Dog Run			200
Reading, Redcay Spring Creek			625
Spring Creek			375
Willow Creek			750
Reese, Cave Pond			500
Roaring Branch, Abbotts Run		1,000	
Blacks Creek		3,000	
Block House Creek		3,000	
Deep Hollow River		1,500	
Deep Hollow River, Left Fork		1,000	
Doney Run		1,000	
Frys Run		1,000	
Hebe Run		1,000	
Hughes Creek		1,500	
Kinsley Run		1,000	
Long Run		1,000	
Lycoming Creek		2,000	
Messner Creek		1,500	
Miller Run		1,000	
Mountain Run		1,000	
Ogden Branch		1,000	
Pack Horse Creek		1,500	
Roaring Branch Creek		2,000	
Roupp Creek		4,000	
Salt Spring Run		2,000	
Tim Grays Run		3,000	
Winslow Bottoms Run		2,000	
Rockwood, McClintocks Run			4,000
Royersford, Pigeon Creek			900
Rock Run			600
Royal Springs Creek			300
Seward, Baker Run			500
Big Spring Run			500
Little Sugar Run			500
Sheridan, Millback Creek			1,000
Sizerville, Cowley Run, Branches of			1,000
Snow Shoe, Beech Creek			500
Benners Run			500
Black Moshannon Creek			500
Clarks Run			500
Fields Run			500
Horse Head Run			500
Little Sandy Creek			500
Michels Spring Run			500

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Snow Shoe, Pine Run			500
Ranking Run			500
Rock Run			500
Sterling Run			500
Stink Town Run			500
Wallace Run			500
Yosts Run			500
Spring Grove, Trone's pond			300
Stroudsburg, Broadheads Creek			1,800
Bushkill Creek			1,800
McMichaels Creek			1,800
Marshalls Creek			1,800
Pocono Creek			1,800
Saw Creek			1,800
Sunbury, Little Shamokin Creek, tributary			400
Tamaqua, Locust Creek			500
Taylor, Gardner Creek			800
Trout Run, Blacks Creek			500
Block House Creek			500
Bunnell Run			500
Deep Hollow Run			500
English Run			500
Flooks Run			500
Four Mile Run			1,000
Little Pine Creek			500
Otter Run			500
Rock Run			500
Six Mile Run			500
Smiths Run			500
Steam Valley Run			500
Texas Creek			500
Trout Run			1,000
Trout Run, Left Fork			500
Wolf Run			1,000
Troy, Bullard Creek		5,000	
Cleveland Run		4,000	
Cross Roads Creek		1,000	
Fall Brook		2,000	
Glen Creek		1,000	
Holmes Creek		4,000	
Kniffer Creek		1,000	
Morgan Creek		1,000	
Palmers Run		1,000	
Phelps Creek		4,000	
Smith Run		1,000	
Tamarack Swamp Creek		1,000	
Tioga River, headwaters		3,000	
Webbers Creek		1,000	
Woods Run		1,000	
Waterville, English River			500
Watts, Donegal Run			600
Hoffmans Run			600
West Nanticoke, Fades Creek			800
Pikes Creek			800
Sandy Run			800
Shingle Run			800
Westport, Trout Run, Kettle Creek Branch			1,000
Williamsburg, Clover Creek			1,500
Piney Creek			1,000
Williamsport, Bear Creek			1,000
Mill Creek			1,000
Mill Run			500
Ogdonia Creek			500
Windber, Allison Run			500
Beaverdam Run			1,000
Berkebyle Run			500
Big Paint Creek			500
Biscuit Spring Run			500
Five Mile Run			500
Glass Run			500
Layton Run			500
Little Dark Shade Creek			500
Little Paint Creek			500
Manges Run			500
Moores Run			500
Paint Creek			500
Piney Run			500
Ripple Run			500

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.			
Windber, Sandy Run			500
Shade Creek, Roaring Fork			1,000
Susie Run			500
Whitaker Run			500
South Carolina:			
Pickens, Cove Creek			3,000
Little Cane Brake Creek			3,000
Little Mountain Creek			3,000
Mill Creek			3,000
Rocky Bottom Creek			3,000
Taylors, Chick Springs Creek			3,000
South Dakota:			
Brownsville, Bear Butte Creek			5,000
Custer, Squaw Creek			20,000
Willow Creek			20,000
Elmore, Spearfish Creek			60,000
Upper Spearfish Creek			35,000
Hill City, Middle Spring Creek			5,000
Newtons Fork Creek			10,000
Palmer Gulch Creek			5,000
Sheridan Lake			4,800
Slate Creek			10,000
Spring Creek			44,000
Sunday Gulch Creek			5,000
Tenderfoot Creek			5,000
Hisega, Rapid Creek			25,000
Hot Springs, Palmer Lake			5,000
Interior, No Flesh Creek			10,000
Iron Creek, Iron Creek			10,000
McLaughlin, Oak Creek			25,000
Maurice, Lost Cabin Creek			1,200
Mystic, Canyon Lake			5,000
Castle Creek			10,000
Cleghorn Run			3,000
Indian School Lake			8,000
Lime Kiln Run			3,000
Little Rapid Creek			10,000
Rapid Creek			58,200
Slate Creek			20,000
Spring Creek			5,000
Tunnell Creek			6,000
Upper Rapid Creek			10,000
Nemo, Box Elder Creek			15,000
Elk Creek			10,000
Pactola, Keenan's pond			5,000
Piuma, Upper Bear Butte Creek			20,000
Rapid City, Deer Creek			8,000
Schamber Pond			5,000
Sicklers Pond			5,000
Rockford, Little Rapid Creek, West Fork			10,000
Silver Creek			5,000
Savoy, Little Spearfish Creek			15,000
Silver City, Rapid Creek			20,000
Spearfish, Crow Creek			8,000
Higgins Creek			15,000
McGoffins Branch			8,000
Nichols Branch			3,000
Pettigrew Branch			3,000
Rushton Creek			8,000
Spearfish Creek			120,000
Spring Creek			10,000
Summers's pond			1,000
Upper Chicken Creek			2,000
Water Cress Creek			5,000
Sturgis, Deadman Creek Pond			3,000
Victoria, Spearfish Creek			4,800
Tennessee:			
Bristol, Cedar Creek			5,000
Hampton, Simerly Creek			8,000
Vermont:			
Arlington, Beaver Meadow Brook		4,000	
Benedict Brook		3,000	
Butternut Gutter Brook		2,000	
Canfield Brook		2,000	
Deming Brook		2,000	
Fayville Brook		8,000	
Lathrop Brook		3,000	
Parson Brook		2,000	
Whitman Brook		3,000	

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Vermont—Continued.			
Barnet, Aiken Brook			1,500
East Peacham Brook			2,000
Harbey Brook			1,500
Roy Brook			1,500
Sucker Brook and branches			1,500
Barre, Downing Brook			2,000
Flanders Brook			2,000
Jimerson Brook			2,000
Labrador Brook			2,500
Barton, Donald Brook			3,000
Roaring Brook			2,500
Rowell Brook			2,000
Williams Brook			3,000
Bennington, Big Hell Hollow Brook			200
Dunville Brook			600
Little Hell Hollow Brook			150
South Brook			300
Walloomsac River			815
Woodford City Brook			200
Bristol, Norton Brook		5,000	
Burlington, applicant	200		
Canaan, Averill Brook			2,500
Big Averill Lake			12,000
Black Branch			2,000
Forest Brook			4,000
Forest Lake			8,000
Lewis Lake			8,000
Little Averill Lake			8,000
Norton Lake			12,000
Nulhegan Brook			12,000
Roaring Brook			1,500
Second Black Branch			6,000
Yellow Branch			6,000
Danville, Brown Brook			3,000
Crane Brook			3,000
Harris Brook			2,000
Haviland Brook			3,000
Heath Brook			2,000
Langmaid Brook			3,000
Mineral Spring Brook			3,000
Palmer Brook			3,000
Pool Brook			3,000
Spaulding Brook			3,000
Sucker Brook			3,000
Thompson Brook			3,000
Tice Brook			3,000
Wells Brook			296
Whyman Brook			300
William Brook			3,000
Derby Line, Tomophobia River			3,000
East Berkshire, Trout Brook			200
East Dorset, Mad Tom Brook		4,000	
Edgewater, Bill Young Brook		5,000	
Lanesboro Brook		5,000	
Enosburg Falls, Cold Hollow Brook			1,000
Ladd Trout Brook			1,000
Mineral Spring Brook			1,000
Pat Brady Brook			1,000
Tyler Brook, Bakersfield Branch			1,000
Greensboro, Caspian Lake			800
Groton, Darling Pond			59,000
Hardwick, Bean Brook			3,000
Bickford Brook			5,000
Bunker Brook			3,000
Burnham Brook			3,000
Cedar Swamp Brook			3,000
Cooper Brook			5,000
Corkscrew Brook			3,000
Currier Brook			3,000
Porter Brook			5,000
Tucker Brook			3,000
Whitney Brook			10,000
Holden, Barnard Brook		5,000	
Clover Vale Brook		4,000	
Coburn Brook		2,000	
Elliott Brook		4,000	
Furnace Brook, branch of		2,000	
Furnace Brook, West Branch		3,000	
Randall Brook		2,000	

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Vermont—Continued.			
Hyde Park, Hyde Pond		5,000	
Mud Pond Brook		3,000	
Inwood, Newman Brook			750
Sutton Brook			1,500
Warden Brook			750
Island Pond, Bear Hill Brook			2,500
Clay Brook			2,500
Clay Hill Brook			2,500
Lightening Brook			2,500
Lost Brook			4,000
McCabe Brook			2,500
Paye Brook			2,250
Smith Brook			4,000
Willey Brook			2,500
Jamaica, Clayton Brook			4,000
Cobb Brook			4,000
Cressey Brook			4,000
Forrester Brook		3,000	
Gorham Brook			4,000
Kidder Brook			4,000
Lyndonville, Bailey Brook			3,000
Speedwell Pond			5,000
Manchester, Battenkill River		20,000	
Battenkill River, West Branch		11,000	
Bourne Brook, North Branch		5,000	
Marshfield, Brookside Pond		10,000	
Doctortown Brook		8,000	
Mears Brook		4,000	
Mollys Falls Branch		8,000	
Niggerhead Brook		4,000	
Middlebury, Dutton Brook		10,000	
Ingles Brook		10,000	
Poor Farm Brook		25,000	
Middlesex, Chase Brook		5,000	
Keene Brook		5,000	
Pierce Brook		4,000	
Slide Brook		5,000	
Montpelier, Ryan Brook			2,500
Morrisville, Beeling Brook			5,000
Bugbee Brook			1,500
Darling Brook		5,000	
Green River Brook			5,000
Lamoille River		5,000	
McFall Brook		5,000	
McNoll Brook		5,000	
Potash Brook			2,300
Ryder Brook			5,000
Newbury, Long Pond		10,000	
Newfane, Grassy Brook and tributaries		20,000	
Newport, Mill Brook			4,000
Miller Brook			8,000
North Bennington, Broad Brook		5,000	
Bushnell Brook		2,000	
Chase Brook (A)		2,000	
Chase Brook (B)		3,000	
Deerfield River, West Branch		5,000	
Evans Brook		2,000	
Hoosic River, North Branch		5,000	
Little Hell Hollow Brook		3,000	
Rider Branch		2,000	
Roaring Brook		4,000	
Stratton Brook		2,000	
North Concord, Cold Brook			1,500
Rainey Brook			4,000
Story Brook			2,000
North Stratford, Dennis Pond			2,500
Norwich, Lake Mitchell			28,000
Orleans, Dewey Brook			5,000
Dutton Brook			5,000
Gallup Brook			5,000
Long Pond			8,000
Willoughby River, Upper			10,000
Plainfield, Kingsbury Brook		3,000	
Pigeon Pond		10,000	
Quechee, Boyd Brook		5,000	
Gulf Brook		5,000	
Strack Brook		5,000	

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Vermont—Continued.			
Quechee, Thomas Brook		5,000	
Udall Brook		10,000	
Randolph, Adams Brook		5,000	
Annis Brook		5,000	
Bass Brook			2,000
Bear Hill Brook			2,500
Beedle Pond		2,000	
Blanchard Brook		5,000	
Bowman Brook		5,000	
Chandler Brook		5,000	
Clough Brook			3,000
Fishers Brook			1,900
Guild Brook		5,000	
Gulf Brook		5,000	
Halfway Brook			2,500
Holman Brook		5,000	
Howard Hill Brook			3,000
Lower Ayers Brook			4,330
Mann Brook		5,000	
Meadow Brook		5,000	
Morse Brook			1,500
Mud Pond		5,000	1,340
Peth Brook			3,830
Poverty Lane Brook			3,500
Roods Brook			2,000
Roxbury Brook		5,000	
Soper Brook		5,000	
Spears Brook			1,500
Thayer Brook		5,000	
Upper Ayers Brook			500
White River, branch of		15,000	
Rutland, Billings Brook		5,000	
Curtis Brook		5,000	
Dunklee Brook		5,000	
East Creek		10,000	
Hewitt Brook		5,000	
Ira Creek		5,000	
Little Brook		5,000	
Osgood Brook		5,000	
Ottaqueechee River and branches		25,000	
Picnic Brook		5,000	
Ripley Brook		5,000	
St. Johnsbury, Adams Brook			500
Bacon Brook			1,000
Bennett Brook			1,000
Blodgett Brook			2,000
Bonett Brook			1,000
Bundy Brook		2,000	
Carpenter Brook			1,500
Cary Brook			1,000
Clifford Brook		2,000	
Cold Brook			1,500
Crane Brook			500
East Branch Brook			500
Fairbanks Brook			2,000
Frog Pond			3,000
Gage Brook (A)		1,000	1,000
Gage Brook (B)			3,000
Harris Brook			500
Hawkins Brook		3,500	500
Heath Brook			500
Hemingway Brook		1,000	
Houghton Brook			5,000
Ladd Brook			300
Langmaid Brook			1,000
Lime Brook			1,500
Lurchin Brook			1,000
Meadow Brook			250
Meecham Brook			1,000
Mineral Springs Brook			1,000
Morrill Brook			2,500
Niles Brook			1,000
North Brook			750
North Church Brook			750
Oram Stevens Brook			2,000
Palmer Brook			1,000
Pierce Brook			1,500

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Vermont—Continued.			
St. Johnsbury, Poole Brook			1,000
Pope Brook			2,500
Pumpkin Hill Brook			3,000
Randall Brook			500
Rickaby Brook			1,000
Roberts Brook (A)			500
Roberts Brook (B)			500
Shattuck Brook			1,500
Shaw Brook			1,000
Sleepers River		9,000	3,000
Spaulding Brook (A)			2,000
Spaulding Brook (B)			500
Stanton Brook		2,000	
Taft Brook			1,000
Tice Brook			500
Walter Andrick Brook			4,000
Wards Brook		2,000	
Waterman Brook		2,000	
Wells Brook (A)			1,000
Wells Brook (B)			1,000
Wheaton Brook			1,500
Whyman Brook			500
Wright Brook		2,000	
Shelburne, Fletcher's pond		2,000	
South Royalton, Alco Pond		10,000	
South Wallingford, South Wallingford Brook		10,000	
Springfield, Commissary Brook			3,000
Garretts Brook			3,000
Joe Boss Brook			3,000
Scrabble Brook			3,000
West Springfield Brook			3,000
Sutton, Bailey Brook			1,500
Bundy Brook			1,500
Burnham Brook			750
Butterfield Brook			750
Clark Brook			3,500
Reed Brook			1,500
Sanborn Brook			1,500
Twombly Brook			1,500
Willard Brook			750
Taftsville, Babcock Brook		6,000	
Beaver Brook		5,000	
Skunk Hollow Brook			600
Townshead, Big Brook		8,000	
Plastered House Brook		10,000	
Simpsonville Brook			3,000
Ware Brook			3,000
Wallingford, Otter Creek, South Branch		8,000	
Roaring Brook		6,000	
Wells River, Peach Brook and tributaries		15,000	
West Burke, Bald Hill Pond			10,000
Beaver Brook			2,000
Eaden Brook			3,500
West Hartford, Rockland Brook			400
Sunny Brook		3,000	
Woodstock, Beaver Brook		3,000	
Beaver Meadow Brook		4,000	
English Mills Brook		8,000	
Evergreen Brook		4,000	
Gulf Brook		12,000	
Happy Valley Brook		5,000	
Virginia:			
Abingdon, The "Meadows" Lake			2,000
Town Creek			8,000
Atkins, Nicks Creek			750
Big Island, Battery Creek			1,000
Hunting Creek			5,000
Milam Creek			1,000
Buchanan, Buchanan Creek			4,000
Covington, Christleys Creek			4,000
Iron Mountain Branch			1,000
Damascus, Beaver Creek			10,000
Front Royal, Belmont Creek			600
Happy Creek			600
Hamilton, Loves Run			500
Harrisonburg, Dry River			5,000
Ivy Depot, Barn Creek			2,000
Longdale, Simpson Creek, North Fork			4,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Virginia—Continued.			
Monterey, James River, headwaters			4,000
South Branch			8,000
Rural Retreat, Brown Brook			250
South Richmond, Gravel Hill Pond			200
Spring Hill, Gordon Branch			4,000
Staunton, Ramsey Creek			5,000
Woodstock, Little Fork Creek			1,000
Little Stony Creek			1,000
Washington:			
Aberdeen, Little Hoquiam River			900
Berlin, Lake Dorothy			3,000
Snoqualmie Lake			3,000
Curlew, Kettle River			4,000
English, Lake Ki			5,000
Everett, Silver Lake			5,000
Fishers, Simmons Creek Pond		2,000	
Four Lakes, Boy Lake		3,000	
Ice House Lake		3,000	
Salmon House Lake		3,000	
Tahomish Lake		2,000	
Waucoma Lake		3,000	
Neppel, Moses Lake			4,000
Republic, Bonaparte Lake			2,000
Ferry Lake			2,000
Seattle, Stubbs Creek			3,000
Snoqualmie, applicant	100,000		
Stevenson, Cascade Lakes		18,000	
Vancouver, Big Washugal Creek			15,000
Yacolt, Cedar Creek			4,000
West Virginia:			
Clover Lick, Elk River, Big Spring Fork			1,200
Laurel Spring Pond			400
Cowen, Williams River			5,000
Hambleton, Roaring Run and branches			1,275
Kingwood, Buffalo Creek			3,000
Marlinton, Elk River			3,200
Sharp Spring Pond			1,000
Meadows, Little Blackfork Run			4,800
Rattlesnake Run			5,800
Pickens, Buchanon River, Middle Fork			4,000
Sewell, Glade Creek			2,000
Manns Creek			2,000
Terra Alta, Brownings Run			2,000
Salt Lick Creek, East Branch			2,000
Salt Lick Creek, West Branch			3,000
Snowy Creek, North Branch			3,000
Wardwell Creek			2,000
Thomas, Blackwater River			1,020
Blackwater River, North Branch			765
Sand Run			765
White Sulphur Springs, Howard Creek			48,000
Spring Creek			49,500
Winterburn, Greenbrier River, and tributaries			8,000
Wisconsin:			
Alma, Big Waumandee Creek			3,000
Braems Valley Creek			3,000
Johns Creek			2,400
Johns Valley Creek			3,000
Little Waumandee Creek			5,400
Norwegian Valley Creek			3,000
Trout Valley Creek			3,000
Wolfs Creek			1,600
Alma Center, Amo Creek			500
Andrews Creek			500
Cisna Creek			1,000
Halls Creek			1,600
Jack Creek			500
Judkins Creek			500
North Branch Creek			1,600
Pugh Creek			500
Schinsing Creek			500
Stockwell Creek			1,600
Trempealeau River, South Fork			1,600
Wheatons Creek			500
Amherst, Jim Een Creek			1,600
Tomorrow Creek			2,400
Waupaca River			2,400

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Arcadia, American Valley Creek			400
Cowles Creek			400
Creher Creek			400
Crystal Spring Brook			400
Eagle Valley Creek			400
Elk Creek			400
English Creek			2,400
Faulds Valley Creek			200
Foster Valley Creek			200
French Creek, East Branch			200
French Creek, West Branch			200
Glencoe Creek			400
Irish Valley Creek			200
Holcomb Cooley Creek			400
Lewis Valley Creek			400
Newcomb Valley Creek			400
North Creek			400
Norway Cooley Creek			200
Reck Valley Creek			200
Riley Creek			400
Schaffner Branch			400
Scofield Creek			400
Tamarack Creek			400
Thompson Valley Creek			200
Traverse Valley Creek			400
Trout Run			400
Trout Valley Creek			400
Wolf Valley Creek			400
Zellar Valley Creek			200
Athelstane, Eagle Creeks, Big and Little			5,000
Bancroft, Rockacre Creek			3,200
Bangor, Adams Valley Creek			1,500
Big Creek			2,500
Burns Creek			3,100
County Line Creek			1,000
Dutch Creek			2,000
Fish Creek			500
Holberg Creek			2,000
Sand Creek			500
Whites Creek			500
Barron, Barker Creek			2,000
Dority Creek			2,000
Englert Creek			2,000
Four Mile Creek			3,000
Hickey Creek			2,000
Johnson Creek			2,000
Jones Creek			2,000
Miller Creek			3,200
Polegama Creek			3,000
Quaderer Creek			2,000
Red Creek			1,000
Rocky Creek			3,000
Silver Creek			2,000
Turtle Creek			2,000
Upper Pine Creek			2,000
Blair, Bear Creek			500
Beaver Creek, North Branch			500
Durham Creek			500
Edwins Creek			500
Engebretson Creek			500
Fly Creek			500
French Creek			500
Halvorson Creek			500
Hegle Creek			500
Herrieds Creek			500
Joe Coulie Creek			500
Johnsons Creek			500
Kittelson Creek			500
Lakes Creek			1,500
Mattison Creek			500
Nordhus Creek			500
Olson Creek			500
Peterson Creek			500
Quarney Creek			500
Rat Coulie Creek			500
Reynolds Creek			1,000
Sampson Creek			500
Shephards Creek			500

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Blair, Skutley Coulie Creek			500
Sletto Creek			1,000
Strum Creek			1,000
Teppen Creek			500
Trump Cooley Creek			1,500
Vosse Coulie Creek			1,500
Welch Creek			500
Bloomer, Conery Creek			2,000
Crisman Creek			2,000
Little Hay Creek			2,000
Oneil Creek, West Branch			3,000
Pine Creek			3,000
Sandy Creek			2,000
Trout Creek			2,000
Blue Mounds, Avang Creek			125
Boleys Creek			800
Camp Creek			900
Frames Creek			900
Garfords Creek			900
Rusks Creek			100
Ryans Creek			900
Walnut Hollow Run			900
Burlington, Henspaters Creek			800
Newmans Creek			1,600
Petersons Creek			1,600
Runkels Creek			1,600
Cable, Namekagon River			3,200
Cadott, Ruskey Creek			2,000
Cashton, Bohemian Valley Creek			900
Brush Creek			900
Cannon Valley Creek			900
Coles Valley Creek			100
Cowee Creek			800
Gronemans Creek			900
Halls Valley Creek			900
Halls Valley Creek, South Branch			100
Hay Valley Creek			900
Heiser Valley Creek			900
Jersey Valley Creek			900
Lyons Valley Creek			900
Meisner Valley Creek			900
Menshe Creek			100
Oium Valley Creek			800
Paulson Creek			100
Pleasant Valley Creek			900
Quinn Creek			100
Russell Valley Creek			900
Schreiner Creek			800
Shotten Creek			800
Soloum Creek			800
Timber Cooley Creek			900
Twenty Four Valley Creek			900
Witchman Creek			900
Cayuga, Ernests Creek			2,000
Wolf Creek			2,000
Colby, Popple River, South Fork of East Fork			3,000
Colfax, Bjornson Creek			2,000
Bronken Creek			1,000
Coloma, Weddee Creek			300
Cumberland, Clam River, North Fork			2,000
Clam River, South Fork			2,000
Hay River			3,000
Hickey Creek			1,000
Johnson Creek			1,000
Leo Creek			3,000
Nelsons Creek			1,000
Orr Creek			1,000
Sand Creek			2,000
Spring Creek			1,000
Deerbrook, Eau Claire River, West Branch			4,000
Delavan, Hansons Creek			500
Dodgeville, Bronker Branch			100
Edmunds Run			200
Jones Branch			100
Josiah Thomas Branch			200
Larsons Branch			200
Roberts Branch			100
Wallie Jones Branch			200
Weiskercher Run			100

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Downing, Anakers Creek			2,000
Annis Creek			2,000
Beaver Creek			2,000
Dillers Creek			1,000
Hay River			2,000
North Fork Creek			2,000
Youngrens Creek			1,000
Zimmermans Creek			2,000
Durand, Big Arkansaw Creek			2,000
Brown Creek			1,200
Cranberry Creek			1,200
Falls Creek			1,200
Fox Creek			1,200
Joe Gray Creek			1,000
Little Arkansaw Creek			2,000
Little Bear Creek			1,200
Plum Creek			1,200
Roaring River Creek			1,200
Spring Creek			1,600
Ward Creek			1,200
Eagle River, Dadetz Creek			2,000
East Ellsworth, Big Cooley Creek			3,000
Big River			3,000
Brush Creek			1,500
Cave Creek			3,000
Gilbert Springs Creek			1,500
Goose Creek			1,500
Little Cooley Creek			1,500
Little Trimbelle Creek			3,000
Lost Creek			3,000
Plum Creek			3,000
Rush River			3,000
Spring Brook			1,500
Trimbelle Creek			3,000
Eau Claire, Awnie Creek			1,000
Barnie Creek			800
Bee Creek			800
Bessie Creek			800
Bessie Run			800
Big Rat Creek			1,000
Big Tree Creek			1,000
Blueberry Creek			1,000
Boulder Creek			1,000
Brush Creek			1,000
Chub Creek			1,000
Culver Creek			800
Daisy Creek			800
Dan Brook			800
Dougherty Creek			800
Ella Creek			800
Ernest Creek			1,000
Evans Creek			1,000
Fish Creek			1,000
Fox Creek			1,000
Gold Creek			1,000
Jacobson Creek			1,000
Kaiser Creek			1,000
Keneer Creek			1,000
Lily Creek			1,000
Rat Creek			1,000
Rose Creek			1,000
Savaria Creek			1,000
Scotch Creek			1,000
Small Creek			1,000
Spring Creek			1,000
Taylor Run			1,000
Thompson Creek			1,000
Violet Creek			1,000
Went Creek			800
Wolf Creek			1,000
Edgerton, Caledonia Springs Run			1,600
Moe Spring Brook			1,600
Eland, Comet Creek			4,000
Embarrass River, West Branch			4,000
Norrie Creek			4,000
Eleva, Big Creek			800
Bollinger Creek			2,800
Hayes Creek			800

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Eleva, Tollefson Creek			800
Trout Creek			800
Elkhorn, Spring Prairie Brook			1,600
Williams Bay Spring Brook			1,600
Ellis Junction, Hand Saw Creek			2,000
Peshtigo River			6,000
Elmwood, Cady Creek			3,000
Eau Galle River			4,500
Gilbert Creek, Middle Branch			1,500
Gilbert Creek, North Branch			1,500
Gilbert Creek, South Branch			1,500
Knights Creek			3,000
Little Missouri Creek			3,000
Penn Creek			3,000
Porter Creek			1,500
Elroy, Hills Creek			3,000
Mile Creek			2,000
Exeland, Nail Creek			2,000
Spring Creek			1,000
Tamarack Creek			400
Fairchild, Black Creek			800
Coon Creek			800
Flick Creek			800
Graves Mill Creek			800
Hay Creek			4,000
Horse Creek			800
Johnson Creek			1,600
Johnson Creek, branch of			4,000
McLarens Creek			1,600
Martens Creek			800
Marvins Creek			800
Pea Creek			4,800
Pettis Creek			1,600
Scott Creek			800
Stockwell Creek			800
Tolles Creek			2,400
Travis Creek			1,600
Yahns Creek			800
Fifield, Spring Creek			800
Fond du Lac, Parsons Run			200
Fountain City, Bohris Valley Creek			2,000
Cooks Valley Creek			2,000
Eagle Valley Creek			2,000
Eagle Valley Creek, South Branch			2,000
Pipers Valley Creek			2,000
Schaffner Valley Creek			4,500
Schaups Valley Creek			4,500
Galesville, Beaver Creek			300
Beaver Creek, North Fork			2,400
Big Tamarack Creek			3,500
Duck Creek			200
French Creek			200
Grants Creek			200
Hardies Creek			1,800
Gays Mills, Baker Creek			200
Welch Creek			700
Genoa, Troutside Pond			500
Glen Flora, Bear Creek			1,600
Josie Creek			1,600
Main Creek, North Fork			6,000
Main Creek, South Fork			1,000
Silver Creek			8,200
Glenwood City, Baleau Creek			2,000
Bests Creek			2,000
Big Beaver Creek			2,000
Bleans Creek			1,000
Bolan Creek			2,000
Bolan Creek, North Fork			1,000
Canfield Creek			2,000
Clarks Creek			1,000
Coan Creek			1,000
Cranes Creek			1,000
Engs Creek			1,000
Glennys Creek			2,000
Grays Creek			1,000
Hay River, Lower Fork			1,000
Hay River, North Fork			2,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Glenwood City, Henderson Creek			2,000
Jacobsons Run			1,000
Johns Creek			2,000
Johnstons Creek			1,000
La Vander Creek			1 000
Little Beaver Creek			2,000
Olson Creek			1,000
Pine Creek			1,000
Sand Creek			2,000
Sand Creek, Lower			1,000
Sand Creek, Upper Fork			1,000
Scottys Creek			1,000
Sullivans Creek			1,000
Symes Creek			1,000
Tiffany Creek			2,000
Upper Sand Creek			2,000
Van Creek			2,000
Van der Hiden Creek			1,000
Wilson Creek			2,000
Zimmermans Run			1,000
Gordon, Ox Creek, Lower			3,000
Ox Creek, Upper			3,000
Grand Marsh, White Creek and tributaries			2,400
White Creek, North Branch			2,400
Grandview, Twenty Mile Creek			3,000
Hammond, Kinnickinnic River			6,000
Hatley, Plover River			4,000
Warder Brook			800
Hawkins, Bear Creek			1,600
Deer Creek			2,400
Elm Creek			500
Howard Creek			300
Little Jump Creek			300
Little Jump Creek, North Fork			200
Little Jump Creek, South Fork			200
Meadow Brook			1,900
Morgan Creek			300
Otter Creek			200
St. Clair Creek			1,600
Taylor Creek			1,600
Hazlehurst, Spring Hole Creek			1,000
Hudson, Greenes Run			1,500
Jefferson Brook			1,500
Willow River			6,000
Hunting, Spalding Creek			4,000
Independence, Amundson Creek			800
Bennett Valley Creek			480
Borst Valley Creek			1,200
Bruce Valley Creek			400
Burt Valley Creek			1,000
Chimney Rock Creek			400
Cooks Creek			1,000
Davis Valley Creek			400
Dubiel Creek			1,000
Elk Creek			400
Engums Valley Creek			1,000
Finnrights Creek			1,000
George Lygas Creek			1,000
Grietz Creek			800
Grunem Creek			800
Gunderson Valley Creek			1,000
Hauge Creek			1,000
Hawkenson Creek			400
Hunts Creek			800
Husselgaard Valley Creek			1,000
Ignatz Lygas Creek			800
Jergen Olsons Creek			800
Killness Creek			1,000
Kurths Creek			200
Lewis Valley Creek			800
Nelson Valley Creek			1,000
Papes Creek			200
Plumb Creek			800
Polkowski Creek			800
Roskos Creek			800
Russell Valley Creek			1,000
Ruste Creek			1,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Independence, Simonson Valley Creek			1,000
Skogstad Creek			1,000
Slanton Valley Creek			1,000
Solfest Creek			400
Taars Creek			400
Traverse Creek			400
Ulberg Creek			1,000
Veum Creek			1,200
Wares Creek			1,000
Wickham Valley Creek			400
Zimmers Creek			1,000
Kendall, Brainard Creek			1,600
Davis Creek			1,600
Foxes Creek			1,600
Wildse Creek			800
Kewaunee, Casco Creek			300
Kewaunee River			300
Kilbourn, Gilmores Creek			2,000
Lacona, Peshtigo River and tributaries			2,000
Starks Creek			3,000
La Crosse, Bohemian Creek			3,000
Davis Creek			200
Halfway Creek			200
Halfway Creek, North Branch			2,000
Mormon Coulee Creek, branch of			2,000
Mormon Coulee Creek, Weekers Branch			2,000
Sand Lake Coolee Creek			2,000
Smith Coulee Creek			100
Ladysmith, Devil Creek			2,000
Little Weirgor Creek			3,000
Main Creek, East Fork			3,000
Main Creek, West Fork			3,000
La Farge, Bear Creek			1,600
Spring Creek			800
Lake Beulah, Beardley Run			1,600
Lehigh, Moose Ear Creek			300
Pekegama Creek			400
Stony Creek			400
Lyndhurst, Aarons Lake			2,000
Beecher Pond			1,000
Bud Pond			1,000
Gardner Creek			1,000
Koonz Lake			2,000
Mill Pond			1,000
Parker Pond			2,000
Red River			4,000
Richard Creek			2,000
Weed Pond			1,000
Maiden Rock, Branagan Creek			800
Pine Creek			800
Manitowoc, Calvin Creek			1,800
Cootway Creek			900
Francis Creek			200
Kappelman Creek			1,600
Krumforst Creek			800
Kruvanek Creek			1,700
Martins Creek			200
Mattoon, Embarrass River			4,000
Embarrass River, Middle Branch			3,000
Embarrass River, West Branch			4,000
Hayes Creek			2,000
Mattoon, Red River			4,000
Red River, Middle Branch			4,000
Red River, West Branch			4,000
Silver Creek			2,000
Mauston, Big Creek			2,000
Brewers Creek			2,000
Mile Creek			2,000
Seven Mile Creek			2,000
Smith Creek			1,000
Spring Creek			1,000
Mazomanie, Marsh Creek			200
Mellen, Devils Creek			4,000
Montreal Creek			4,000
Offegard Creek			2,000
Tyler Fork Creek			3,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Menomonie, Anderson Run			600
Annis Creek			600
Asylum Springs Run			600
Ballard Run			600
Beaver Creek			600
Big Hay Creek			600
Big Meadow Run			600
Big Missouri Creek			600
Bishop Creek			600
Biss Creek			600
Blair Creek			600
Bolan Creek			600
Boland Run			600
Clacks Creek			600
Coon Creek			600
Cowan Creek			600
Cranberry Creek			600
Deming Creek			600
Drowley Creek			600
Dushane Creek			600
Eau Galle River			600
Eddy Creek			600
Eighteen Mile Creek			600
Elk Creek			600
Fall Creek			600
Fighting Creek			600
Galloway Creek			600
Gilbert Creek			600
Gilbert Creek, South Fork			600
Grutt Creek			600
Halls Creek			600
Hay River			600
Hay River, South Fork			600
Hay Run			600
Home Farm Springs Run			600
Iron Creek			600
Irving Creek			600
Irving Creek, Austin Fork			600
Irvington Creek			600
Johns Creek			600
Johnson Creek			600
King Creek			600
Knights Creek			600
Knipple Creek			600
LaFarge Creek			600
Lambs Creek			600
Lambs Creek, North Fork			600
Lewis Run			600
Little Beaver Creek			600
Little Elk Creek			600
Little Missouri Creek			600
Little Otter Creek			600
Little Rock Creek			600
Little Sand Creek			600
Losbys Run			600
Lower Pine Creek			600
Lynch Creek			600
McCarthy Creek			600
Mud Creek			600
Otter Creek			600
Palmers Run			600
Paradise Creek			600
Parkers Run			600
Pine Creek			600
Popple Creek			600
Pusky Creek			600
Roach Creek			600
Rock Creek			600
Ruch Creek			600
Sand Creek			600
Shaffer Creek			600
Simonson Creek			600
Sinking Creek			600
Sly Creek			600
Smith Creek			600
Snyder Creek			600

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Menomonie, Spring Creek			600
Stoner Creek			1,200
Thum Creek			600
Tiffany Creek			600
Torgerson Creek			600
Trout Creek			600
Varney Creek			600
Webber Creek			600
White Creek			600
Wilcox Creek			600
Wilson Creek			600
Wilson Creek, North Branch			600
Wolfs Creek			600
Mercer, Presque Isle River			5,000
Merrill, Averill Creek			1,600
Barnes Creek			1,600
Hansons Creek			1,600
Johnson Creek			1,600
Little Hay Meadow Creek			2,400
Newwood River			1,600
Ox Bow Creek			1,600
Pat Smith Creek			2,400
Prairie Creek			1,600
Silver Creek			1,600
Smith Creek			1,600
Spring Creek			1,600
Ten Mile Creek			1,600
Weege Creek			1,600
Merrillian, Cisna Creek			800
Gearing Creek			800
Halls Creek			800
Hammond Creek			800
Hayden Creek			800
Hensel Creek			800
Mound Creek			800
Reichenbach Creek			800
Snow Creek			800
Stockwell Creek			800
Van Herset Creek			800
Visneau Creek			800
Millston, Clear Creek			800
Kirby Creek			800
Madison Creek			800
Pigeon Creek			800
Robinson Creek			4,000
Stony Creek			800
Trout Run			1,600
Upper Robinson Creek			800
Wyman Creek			2,000
Mondovi, Amidon Creek			2,000
Bennet Valley Creek			800
Big Creek			2,000
Brown Creek			3,000
Carrol Creek			1,000
Cooks Creek			800
Coon Creek			2,000
Cranberry Creek			2,000
Davis Creek			1,000
Day Creek			1,000
Dillon Creek			2,000
Dutch Creek			2,000
East Creek			800
Elk Creek			800
Englesby Creek			2,000
Farrs Creek			800
Gilman Valley Creek			800
Hadley Creek			800
Hicks Creek			2,000
Jackson Creek			3,000
Lee Valley Creek			800
Merritt Creek			1,000
Miles Creek			1,000
Myer Creek			1,000
Peeso Creek			2,000
Pratt Creek			800
Rider Creek			1,000
Rossman Creek			1,000

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Mondovi, Spring Creek			2,000
Three Mile Creek			800
Turner Valley Creek			800
Van Pelt Creek			2,000
Whelan Creek			2,000
White Creek			2,000
Wilson Creek			2,000
Mount Horeb, Beckwith Creek			100
Black Earth Creek			125
Blue Valley Creek			100
Bohns Creek			100
Gallagher Creek			100
German Valley Creek			100
Gesler Creek			100
Golbins Creek			100
Hoffs Creek			100
Holsten Creek			125
Kahl Creek			125
Kelihers Creek			100
Kittleson Creek			125
Lindstrom Creek			100
Lohffs Creek			100
Moens Creek			100
Mount Vernon Creek			100
Ness Creek			100
Noons Creek			100
Oddens Creek			125
Saga Bottom Creek			125
Sand Rock Creek			125
Spaandrus Creek			125
Taschers Creek			125
Murry, Weirgor Creek			3,000
Nashville, Rogers Creek			2,000
New Auburn, Sand Creek, North Branch			2,000
Sand Creek, South Branch			2,000
New Richmond, Cedar Creek			1,000
Ten Mile Creek			3,000
Newry, Homstad Creek			100
Jersey Spring Creek			100
Norwalk, Cook Creek			1,600
Moors Creek			1,600
Oconomowoc, Burke Creek			200
Oconomowoc Creek			200
Owen, Morland Creek			800
Pine Creek			4,000
Rock Creek			2,800
Schultz Creek			800
Servaty Creek			800
Spring Creek			1,000
Trappers Creek			3,000
Parrish, Prairie River			4,000
Pepin, Big Plum Creek			2,000
Bogus Creek			1,000
Bogus Creek, North Branch			1,000
Ell Creek			1,000
Ell Creek, West Branch			1,000
Little Plum Creek			1,000
Little Plum Creek, East Branch			2,000
Little Plum Creek, North Branch			2,000
Lost Creek			1,000
Lost Creek, East Branch			1,000
Lost Creek, West Branch			1,000
Porcupine Creek			2,000
Roaring Run			1,000
Roaring Run, East Branch			1,000
Roaring Run, South Branch			1,000
Sixteenth Creek			1,000
Phelps, Black Jack Creek			3,000
Muskrat Creek			2,000
Plainfield, Rochacree Creek			200
Ten Mile Creek			300
Prentice, Mondo Creek			3,000
Readstown, Elk Creek			800
Flanagan Creek			800
John Anderson Creek			800
Norwegian Hollow Creek			800

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Rhinelander, Bear Skin Creek			8,000
Four Mile Creek			3,000
Stella Creek			4,000
Rice Lake, Barker Creek			2,000
Bear Creek			2,000
Big Springs Creek			2,000
Brown Creek			2,000
Carters Creek			2,000
Cranberry Creek			2,000
Deitz Creek			2,000
Hay Creek			2,000
Hemlock Creek			2,000
Holmes Creek			2,000
Kenyon Creek			2,000
Kettle Creek			2,000
Knudson Creek			2,000
Lawler Creek			2,000
Little Tuscobia Creek			1,000
Log Creek			2,000
Lost Creek			1,000
Martin Creek			2,000
Mud Creek			2,000
Overby Creek			2,000
Pekegama Creek			2,000
Pepper Creek			2,000
Peterson Creek			2,000
Savage Creek			2,000
Silver Creek			2,000
Smith Creek			2,000
Spoon Creek			2,000
Sucker Creek			2,000
Summers Creek			2,000
Tuscobia Creek			1,000
Richland Center, Ash Creek			200
Bear Creek			300
Brush Creek			300
Clarsons Creek			1,600
Fancy Creek			300
Hawkins Creek			200
Little Willow Creek			300
Mill Creek, East Branch			100
Mothers Creek			200
Rocky Branch			1,000
Wanless Creek			200
Ridgeway, Bennetts Creek			800
Stephens Creek			1,600
River Falls, East Fork River			3,000
Kinnickinnick Creek, Lower			3,000
Kinnickinnick Creek, Upper			4,500
Nye Creek			3,000
Rocky Branch			3,000
South Fork River			3,000
Tedd Creek			3,000
Trimbelle Creek			4,500
Roberts, Kinnickinnick River			6,000
Rush River			4,500
Sauk City, Dunlaps Creek			200
Koepples Creek			1,600
Sugar Grove Creek			1,600
Sheboygan Falls, Milwaukee River, North Branch			200
Rhine Creek			300
Soldiers Grove, Trout Creek			200
Soperton, Knowles Creek			3,000
Sparta, Beamer Creek			100
Big Creek			100
Bullen Creek			100
Cataract Mill Pond			100
Clear Creek			100
Dustin Creek			100
Printz Creek			100
Richards Creek			100
Schmelling Creek			100
Soaper Creek			100
Tarr Creek			800

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Spooner, Rocky Ridge Creek			8,000
Spring Green, Jones Creek			200
Spring Valley, Bahrs Creek			1,500
Burghardt Creek			1,500
Cave Creek			1,500
Eagle Spring Creek			1,500
French Creek			1,500
Gilbert Creek, North Fork			1,500
Gilbert Creek, South Fork			1,500
Lousy Creek			1,500
Mines Creek			1,500
Stanley, Babbett Creek			1,000
Hay Creek			3,000
Loper Creek			2,000
Muskrat Creek			3,000
Muskrat Creek, North Fork			2,000
Shoulder Creek			2,000
Swims Creek			3,000
State Line, Pickerel Creek			1,600
Spring Brook			2,000
Tamarack Creek			2,400
Stone Lake, Elm Creek			2,000
Hay Creek			4,000
Mackay Creek			3,000
Tigerton, Beedle Creek			2,000
Comet Creek			2,000
Deleglise Creek			2,000
Embarrass River, Middle Branch			2,000
Embarrass River, South Branch			2,000
Jolin Creek			1,000
Pony Creek			2,000
Simpson Creek			1,000
Steinke Creek			2,000
Tiger Creek			2,000
Willow Creek			1,000
Tioga, Black Creek			2,000
Britt Creek			2,000
Cameron Creek			1,000
Dickerson Creek			1,000
Dinner Horn Creek			1,000
Gorman Creek			1,000
Hay Creek			5,000
Horse Creek			2,000
Iron Creek			1,000
Little Black Creek			2,000
Pony Creek			1,000
Rocky Creek			2,000
Ryan Creek			1,800
Scott Creek			1,800
Series Creek			800
Surveyor Creek			2,000
Thompson Creek			2,000
Wedges Creek			2,000
Wedges Creek, East Fork			1,800
Tomahawk, Berry Creek			2,000
Gut Creek			2,000
Kuehkings Creek			2,000
Little Pine Creek			2,000
Rocky Creek			2,000
Squaw Creek			1,000
Trempealeau, Beaver Creek			2,000
Carrigans Creek			100
Crystal Valley Creek			2,000
Dutch Creek			2,100
Fox Cooley Creek			2,100
French Creek			2,200
French Creek, North Branch			100
French Creek, West Branch			100
Holcomb Cooley Creek			2,200
Norway Cooley Creek			2,100
Pine Creek			100
Tamarack Creek			8,100
Turtle Lake, Beaver Creek			400
Schmids Creek			200
Turtle Creek			400

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Viroqua, Bad Ax River			300
Bad Ax River, North Fork			600
Be a bout Creek			600
Bishop Branch			600
Brookville Branch			600
Browns Branch			600
Brush Hollow Creek			600
Careys Creek			600
Cedar Creek			600
Cheatham Branch			600
Connaway Creek			600
Cook Branch			600
Duck Egg Branch			600
Elk Run			600
Getter Creek			600
Harrison Branch, North			600
Harrison Branch, South			600
Pine Hollow Branch			600
Purdy Branch			600
Reeds Creek			600
Rogers Creek			600
Sees Branch			600
Sidie Branch			600
Springville Branch			600
Tainter Branch			500
Willow Springs Branch			900
Waldo, Milwaukee River, North Branch			1,600
Spring Farm Branch			1,600
Warren, Brandy Creek			2,800
Castle Rock Creek			1,800
Clear Creek			2,000
Dane Creek			800
Daupke Creek			800
First Creek			800
Fish Creek			4,600
Harp Creek			800
Lowry Creek			2,000
Mill Creek			800
Myers Creek			2,000
Poff Creek			800
Rudd Creek			1,000
Sand Creek			800
Second Creek			800
Town Creek			2,800
Walworth Creek			800
Waukesha, Bark River			200
Bidwell Creek			200
Popular Creek			200
Salesville Creek			100
Wolf Creek			200
Wrights Creek			200
Waupaca, Emmons Creek			300
Little Wolf River, South Branch			3,500
Radley Creek			2,700
Waupaca River			400
Wausau, Big Sandy Creek			2,800
Westby, Coon River, North Branch			100
Coon River, South Branch			100
Dybing Run			100
Esofea Creek			100
Isakson Creek			100
Jenson Creek			100
Knapp Creek			100
Larson Creek			100
Nordbo Creek			100
North Timber Coolee Creek, branch of			200
Olsen Springs Run			100
Overhagen Run			100
Sandbakken Run			100
Seas Branch			600
Sending Springs Run			100
Sherve Run			100
Simmon Creek			100
Skang Run			100
Skarsmoen Run			100

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

BROOK TROUT—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			
Westby, Spring Cooley Creek			200
Spring Valley Creek			100
Sveen Spring Run			100
Sveum Creek			100
Timber Coulee Creek, Northeast Branch			500
Von Ruden Creek			600
Youngs Run			160
Whitehall, Bruce Valley Creek			1,600
Elk Creek			1,600
Erwin Creek			800
Fly Creek			1,600
Pigeon Creek			1,600
Pikes Creek			800
Plum Creek			800
Russell Creek			800
Sleepy Creek			800
Van Sickel Creek			800
Welch Creek			1,600
Whitewater, Bluff Creek			2,400
Bluff Brook			200
Bradway Creek			2,500
Gould Creek			1,700
Steele Brook			2,500
Territorial Brook			200
Whitewater Creek			1,800
Winter, Casey Creek			4,000
Wyocena, Duck Creek			2,000
Wyoming:			
Beulah, South Redwater Creek			15,000
Upper Sand Creek			5,000
Woods Pond			1,000
Bonneville, Bonneville Reservoir			600
Hanna, Dickinson's lake			2,100
Medicine Bow River			3,500
Lander, Baldwin Creek			20,000
Little Popo Agie River			25,000
Louis Creek			15,000
Popo Agie River, Roaring Fork			15,000
Laramie, Deep Lake			2,800
Fox Creek			2,100
Lake Owen			2,800
Little Laramie River, Middle Fork			2,100
Reservoir Lake			2,100
Silver Lake			2,100
Silver Run Lake			2,100
State fish commission	75,000		
Topy Lake			1,400
Manderson, Paint Rock Creek, Middle Fork			900
Soldier Creek			900
Newcastle, Cold Springs Creek			2,100
Ranchester, Graves Creek			700
Owen Creek			2,100
Rock Springs, Fall Creek			700
Lake Creek			700
Newfork River			2,100
Silver Creek			700
Sweeney Creek			700
Willow Creek			700
Saratoga, North Platte River			25,000
Sheridan, Cross Creek			2,100
Dome Lake			15,000
Little Goose Creek			3,500
Sundance, South Miller Creek			10,000
Thermopolis, Buffalo Creek			900
Cottonwood River			900
Ditch Creek			600
Kirby Creek			600
Red Creek			600
Yellowstone, Blacktail Deer Creek			15,000
Obsidian Creek			15,000
Total [a]	507,150	5,700,263	6,965,167

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[a] Lost in transit, 6,800 fry and 21,050 fingerlings.

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

SMELT.

Disposition.	Eggs.	Fry.
Maine:		
Cherryfield, Tunk Pond		2,000,000
Dedham, Toddy Pond		3,000,000
Otis, Great Brook		900,000
Michigan:		
Williamsburg, Weesh Ko Wong Pond	4,500,000	
New Hampshire:		
Derry, Beaver Lake		1,000,000
New York:		
Raquette Lake, Raquette Lake	5,000,000	
Vermont:		
Lyndonville, State fish commission	5,000,000	
Total	14,500,000	6,900,000

GRAYLING.

Disposition.	Eggs.	Fry.
Colorado:		
Loveland, Buckhorn River		48,000
Michigan:		
Mayfield, Boardman River		45,000
Montana:		
Belgrade, East Gallatin River		36,000
West Gallatin River		84,000
Bigtimber, Bigtimber Creek, North Fork		30,000
Lake Walvord		30,000
Butte, Applicant	250,000	
Ennis, Power Company Lake		1,600,000
Wyoming:		
Sheridan, Little Piney Creek	100,000	
Total	350,000	1,873,000

CRAPPIE.

Disposition.	Fingerlings, yearlings, and adults.	Disposition.	Fingerlings, yearlings, and adults.
Alabama:		Colorado:	
Booth, Laurel Pond	60	Loveland, Chapman Lake	275
Letohatchie, Lake Letoa	180	Connecticut:	
Opelika, Cotton Mills Pond	60	Waterbury, Pritchard Pond	400
Arkansas:		Delaware:	
Alma, Big Clear Creek	1,200	Laurel, State Farm Pond	600
Beebe, Bartlett Springs Lake	300	Florida:	
El Dorado, Mathews Pond	900	Grandin, Grandin Lake	100
Fayetteville, Illinois River	900	Lady Lake, Burchfield Lake	135
Hot Springs, Fordyce Lake	600	Hermosa Lake	200
Malvern, Lake Stanley	900	Jug Lake	135
Mammoth Springs, Tracey Creek	1,200	Lady Lake	135
Ogden, Clear Lake	1,200	Park Lake	135
Prescott, Brysons Pond	600	Micanopy, Tuscawilla Lake	200
Rottaken, Bayou Meto	900	Georgia:	
Big Maumelle Creek	900	Atlanta, Spring Lake	100
Brodie Creek	600	Cedartown, Benedict Pond	200
Cunningham Lake	900	Cohutta, Chuckaleechee Lake	150
Faulkner Lake	900	Columbus, Wildwood Lake	200
Ferguson Lake	1,200	Comer, Gholston's pond	200
Five Mile Creek	300	Cuthbert, Barfield's pond	125
Hills Lake	900	Crapps Pond	125
Ink Bayou	600	Gormley Pond	125
Little Maumelle Creek	900	Jack Sealy Pond	125
Loomis Lake	900	Sealy's pond	125
Maple Creek	300	Tripp Pond	125
Rock Creek	600	Dallas, Paulding Power Pond	200
Rosenbaum Lake	900	Dalton, Camp's lake	150
Trammell Lake	900	Fairburn, Favers Pond	400
Waldo, Haynie's pond	300	Hahira, Hodge's pond	100
Strong's pond	300	Lake Park, Lake Barchampie	175
Water's pond	300	Newman, Gallaway Ponds	100

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

CRAPPIE—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Georgia—Continued.	
Newman, Pearl Spring Lake	400
Rome, Beach Creek	200
Lake Frances	100
Social Circle, Day's pond	100
Stone Mountain, Venable Lake	200
Tallapoosa, Summerlin's lake	100
Williamson, Pryor's pond	100
Illinois:	
Belleville, Fern Glen Lake	50
Gilmore Lake	75
Oakdale Lake	25
Ogle Lake	50
Belvidere, Kishwaukee River	2,000
Carbondale, Star Lake	75
Thompson Lake	75
Winchester Lake	75
Freeburg, Freeburg Lake	50
Freeport, Pecatonica River	3,000
Yellow Creek	2,400
Highland, Oak Hill Lake	75
Hillsboro, Sun Dodgers Lake	75
Irving, Funk's lake	75
Stafford's pond	50
Wilson's pond	50
Libertyville, Insull's pond	600
Meredosia, Meredosia Bay	210
Mount Olive, Mount Olive Reservoir	570
Reynolds, Ketzle Pond	40
Whitehall, Whitehall Pond	100
Indiana:	
Boonville, Daily View Pond	160
De Pauw, Blue River	225
Goshen, Hunters Lake	300
Wolfe Lake	300
Princeton, Spring Brook	50
Sunman, Schwears Pond	25
Iowa:	
Bellevue, Mississippi River	553,200
State fish commission	5,000
Chester, Upper Iowa River	400
Dyersville, Maquoketa River, North Fork	400
Emmetsburg, Medium Lake	143
Iowa Falls, Iowa River	9,000
North McGregor, Mississippi River	123,450
Pleasantville, Bare's pond	200
Kansas:	
Chanute, Allen's lake	200
Kingman, Pitcher's pond	100
Williams's pond	50
Kentucky:	
Austerlitz, Hill Top Pond	25
Lake Stony Point	320
Bagdad, Railroad Pond	360
Bardstown, Beach Fork Creek	100
City Lake	100
Bowling Green, Jennings Creek	200
Buckner, Longest Pond	180
Campbellsburg, Garriott's pond	200
Hedge Pond	200
Crofton, Crofton Lake	200
Cumberland Falls, Cumberland River	50
Danville, Anderson's pond	100
Caldswell's pond	100
Johnson's pond	100
Maplewood Pond	100
Demossville, Licking River	400
Elizabethtown, Perceful's pond	25
Eminence, Baskett's pond	90
Napierala's pond	90
Frankfort, Blythe's pond	180
Silver Lake	180
Guthrie, Pendleton's pond	200
Harrodsburg, Goddard's pond	100
Jackson's pond	100
Kentucky—Continued.	
Harrodsburg, Kyle's pond	100
Hempridge, McCormack's pond	100
Hyattsville, Lake Ray	50
Indian Fields, Hisle's pond	180
Jackson, Kentucky River	50
La Grange, Royal Inn Lake	180
Sauer's pond	90
Lawrenceburg, Lake Mary Elizabeth	100
Rice's pond	100
Lebanon, Rolling Fork River	160
Lexington, Brand's pond	90
Burrier's pond	90
Lake Blanch	100
Lake Hazzard	360
Murry's pond	90
Reservoir No. 4	720
Serpell's pond	180
London, Hackney's pond	25
Stock Pond	25
Louisville, Park View Pond	180
Madisonville, Howard's pond	200
Madisonville Lake	300
Moore's pond	100
Midway, South Elkhorn Creek	180
Moberly, Muddy Creek	25
Morehead, Garten Lake	160
Moreland, Clear Pond	25
Nunnelly's pond	26
Morganfield, Taylor's pond	100
Mount Sterling, Williams's pond	180
Nebo, Hobgood's pond	100
Nicholasville, Hooverhurst Ponds	90
Paris, Flat Run	50
Lockwood Pond	50
Wyatt's pond	100
Paynes Depot, Payne's pond	100
Pisgah, Jesse Pond	91
Shenault Pond	90
Slant Pond	90
Princeton, Martin Pond	100
Osborn Pond	100
Providence, Mining Company Lakes	200
Richmond, Silver Creek	25
Shelbyville, Bonnie Brook Pond	100
Lake Jonorachqua	100
Lake Offutt	200
Moxley Branch	100
Old Masons Home Pond	200
Simpsonville, Walters's pond	100
Vanarsdell, Wilham's pond	50
Vanceburg, Salt Lick Creek	400
Veechdale, Great Lake	160
Versailles, Neet's pond	90
Waddy, Benson Creek	100
Winchester, Ashdale Pond	90
Calmes's pond	90
Carroll's pond	90
Club House Lake	360
Crethmere Pond	90
Farm Pond	90
Fox's pond (A)	90
Fox's pond (B)	90
Gardner's pond	90
Gilbert's pond	90
Goff's lake	180
Harris's pond	90
Johnson's pond	90
Jones's pond	90
Merritt's pond	90
Miller's pond	90
Nelson Pond	90
Pendleton's pond	90
Piersall's pond	90
Red Cross Dairy Pond	90
Scott Pond	90

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

CRAPPIE—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Kentucky—Continued.	
Winchester, Spahr's pond (A)	180
Spahr's pond (B)	180
Spahr's pond (C)	90
Stephenson Pond	90
Strodes Creek	180
Waterworks Lake	180
Wood Lake	180
Louisiana:	
Arcadia, Atkins's pond	30
Athens, New's pond	20
Willow Pond	20
Caspiana, Caspiana Lake	50
Hammond, Stuart's pond	60
Homer, Clear Creek	20
Jonesboro, Wyatt Park Pond	50
Lindsay, McKowen's pond (A)	60
McKowen's pond (B)	20
Mills's pond	40
Mansura, Grand Ecore Creek	25
Ruston, Whitten's pond	20
Slaughter, Lot Pond	20
Trenton, Bull Bayou, Head Spring	20
Spider Pond	20
Maryland:	
Hyattsville, Bellevue Pond	600
Massachusetts:	
Island Creek, Island Creek Pond	200
Michigan:	
Moran, Brevort Lake	1,000
Wetmore, Cookson Lake	300
Doe Lake	500
Grass Lake	500
Half Moon Lake	500
Harris Lakes	300
Steward Lake	500
Wiley Lake	300
Minnesota:	
Bagley, Lake Lomond	300
Browns Valley, Lake Traverse	500
Fairmont, Silver Lake	650
Fergus Falls, Stalker Lake	125
Fosston, Cross Lake	400
Hackensack, Stony Lake	400
Hokah, Pettibone Park Lake	450
Homer, Mississippi River	329,077
Mentor, Maple Lake	500
Minneapolis, Glenwood Lake	300
Lake Calhoun	300
Lake Harriet	300
Lake of Isles	300
Walker, Long Lake	250
Mississippi:	
Corinth, Hinton's lake	33
Missouri:	
Cuba, Clute's pond	400
Dodson, Progress Club Pond	300
Ferguson, Wabash Club Lake	200
Grandview, King's lake	300
Lake Clare	200
Holden, Nawgel's pond	100
Irwin, Reed Boles Lake	200
Kansas City, Armour Lake	300
Louisiana, Salt River	200
Nevada, Nipp's lake	270
Osceola, Spring Lake	200
Ritchey, Shoal Creek	200
Rolla, Blue Spring Creek	600
Little Dry Fork Creek	600
Strasburg, Curl's pond	100
Versailles, Hineman Branch	290
Nebraska:	
Dickens, Braugh Lake	300
New Jersey:	
Lake Hopatcong, Lake Hopatcong	1,050
North Carolina:	
Franklinton, Morris's pond	25
Hendersonville, Lake Wajaw	50
High Point, Fairmere Lake	75
Raleigh, Yates Pond	50
Scotland Neck, Hall's pond	75
Smith's pond	100
North Dakota:	
Bottineau, Lake Metegoshe	100
Buttzville, Webster's pond	125
Devils Lake, Devils Lake	675
Freshwater Lake	300
Wood Lake	400
Petrel, Lemmon Public Reservoir	300
Waterworks Pond	300
Richardson, Mitchell's pond	200
Ruso, Strawberry Lake	250
St. John, Crows Lake	200
Gordon Lake	100
Hooker Lake	200
Jarvis Lake	100
Lake View	100
Little Carpenter Lake	200
Ohio:	
Batavia, Little Miami River, East Fork	50
Stone Lick Creek	200
Oakley, Madison Park Lake	25
Loveland, Little Miami River	75
Ravenna, Stewart Lake	600
Oklahoma:	
Ardmore, Herndon's pond	50
Jolly's pond	75
Lake Scott	150
Robert's pond	150
Taylor's pond (A)	50
Taylor's pond (B)	100
Bliss, Hill's pond	50
Chattanooga, Midway Lake	100
Chickasha, Mollet's pond	100
Shanoan Springs Pond	125
Coalgate, Rex's pond	100
Elgin, Southside Lake	75
Enid, Willow Spring Lake	150
Forgaw, Kiowa Creek	250
Francis, Oliver's pond	50
Gage, Twenty Five Mile Creek	100
Guthrie, Clear Water Lake	150
Deep Water Lake	200
Oak Grove Lake	150
Kiowa, Buck Creek	150
City Lake	150
Mangum, Lake Wagoner	150
Marietta, Eddleman & Graham's pond	100
Hicks's pond	100
Mooreland, Barrick's pond	50
Twigley Lake	50
Muskogee, Illinois River	250
Oklahoma City, Jewelryman Lake	200
Northeast Lake	200
Pawhuska, Bird Creek	200
Clear Creek	200
Ponca City, Bois d' Arc Creek	200
Prague, Eret's lake	100
Skedee, Walters's pond	50
Tangier, Big Spring Lake	50
Horseshoe Lake	100
Stone Lake	100
Vici, South Persimmon Pond	50
Wagoner, Moonlight Lake	150
Weldon's pond	100
Woodward, Blue Lake	50
Indian Creek Lake	100
Kollar's lake	50
Lilac Lake	50
McPherson Lake	100

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

CRAPPIE—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Oklahoma—Continued.	
Woodward, Roundup Creek	50
Santa Fe Lake	100
Snow Lake	50
Spring Creek Lake	50
Spring Lake (A)	75
Spring Lake (B)	200
Spring Lake (C)	50
Stengelmeier's lake	50
Turnbull's lake	100
Williams's pond	100
Woodward Creek	50
Pennsylvania:	
Cambridge Springs, Edinboro Lake	200
Lebanon, Mount Gretna Lake	150
Water House Lake	150
Pequea, Susquehanna River	150
South Carolina:	
Columbia, Hillcrest Lake	50
Greenville, Bushby Creek	50
Piney Mountain Lake	50
Pomaria, Cannon Creek Lake	75
Wellford, Tucapau Pond	75
South Dakota:	
Amherst, Impecoven's pond	100
Arlington, Poinsett Lake	300
Brookings, Oakwood Lake	300
Clear Lake, Clear Lake	450
Langford, Cottonwood Lake	100
Long Lake	167
Nine Mile Lake	100
Miller, Pearl Creek	100
Mitchell, James River	1,500
Parkston, Isaak's pond	100
Pierre, Lake Medoka	300
Tennessee:	
Adams, Sanford's pond	125
Campbell Junction, Campbell Junction Pond	250
Chattanooga, Dollar Pond	25
Lookout Ponds	50
Queen and Crescent Lake	75
Columbia, Duck River	125
Estill Springs, Elk River	375
Franklin, Dalton Pond	125
Hendersonville, Adams's pond	125
Hickory Valley, Pabst's pond	150
Michigan City, Bonnie Oaks Pond	50
Monterey, Pettit Pond	250
Mount Pleasant, Emerald Lake	125
Shelbyville, Bearden's pond	125
Springfield, Red River, North Fork	375
Trenton, Powell and Holmes's pond	100
Westmoreland, Story's pond	125
Texas:	
Abilene, Dead Man Pond	50
Acampo, Davis's pond	50
Albany, Sedwick Lake	50
Aledo, Sweet Marie Pond	50
Alpine, Lake Logan	50
Alto, Terrell Lake	25
Amarillo, Lake Arcadia	50
Annona, Boswell and Pittman's pond	25
Comal Lake	25
Crystal Lake	50
English Lake	25
Hicker Denison Lake	25
North English Lake	25
Arlie, McKnight's pond (A)	50
McKnight's pond (B)	50
Arlington, Mill Creek	50
Aspermont, Couch Lake	65
Owsley's pond	50
South Ranch Pond	50
Tonkaway Lake	65
Texas—Continued.	
Athens, Broom's lake	50
Coker's pond	100
Donnell's pond	50
Jarrell's pond	125
Mills's pond	100
Stone's lake	50
Austin, Lake Austin	500
Mayfield's lake	475
Wheless Creek	50
Avery, Posey's pond	25
Baird, Holmes's pond	50
Sniders Pond	50
Birome, Lake Barton	50
Bivins, Potter's lake	50
Walker's pond	50
Blooming Grove, Bryant's mill pond	50
George's pond	50
Langston's pond	50
Bluffdale, Baldridge's pond	25
Bogata, Webb Pond	65
Bonham, Bonham Club Lake	50
Boyd Club Lake	50
Carter's pond	50
Oak Lake	50
Wise Lake	50
Brady, Brady Creek	50
Wilbank's pond	50
Brandon, Lakenon Lake	100
Brooksmith, Nunn's pond	50
Brownwood, Lawson's pond	25
Sanders's pond	25
Caldwell, Birch Lake	50
Gum Lake	50
Calvert, Davis's pond (A)	25
Davis's pond (B)	25
Cameron, Martin's pond	50
Canadian, Lake Hood	75
Lake Hoover	25
Carthage, Adams's pond	100
Celeste, Green's pond	40
Center, Lane's pond	50
Childress, Feilds's pond	50
Lake Scott	50
North City Lake	50
Clarksville, Clear Lake	50
Long Lake	100
Morris's lake	50
Red River Club Lake	100
Trent Lake	25
Turner Lake	100
Ward Lake	75
Cline, Turkey Creek	150
Clyde, Coyote Pond	25
Mountain Pasture Pond	40
Pecan Bayou	50
Coleman, Horne & Beck's pond	50
Ranch Creek Lake	50
Cooper, Lain's pond	100
Corsicana, Burk Lake	200
Navarro Club Pond	200
Crockett, Wilson Lake	50
Crowell, City Lake	50
Dallas, Highland Park Lake	100
Silver Lake	50
Del Rio, Devils River	100
Detroit, Fairview Lake	50
Futrell's pond	25
Goat Lake	50
Gray Lake	100
Mathis Pond	25
Mill Pond	50
Persimmon Pond	50
Semple Pond	50
Sharp's pond	25

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

CRAPPIE—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Texas—Continued.	
Detriot, Spring Lake	25
Sunnyside Pond	25
Dodd City, Johnson's pond	25
Smith's lake	25
Dundee, Haley's pond	50
Edgewood, Ellis's lake	50
Elkhart, Camp's pond	50
Ennis, Boren's pond	100
Rumbo's pond	30
Todd Lake	100
Willow Pond	90
Everman, Hanger's pond	30
Farmersville, Park Lake	100
Forney, Criswell's pond	25
Fort Worth, Alta Vista Lake	100
Duringer's pond	50
Hush Lake	50
Interurban Lake	75
Roe Lake	25
Trinity River, Clear Fork	175
Walnut Creek	150
White Lake	25
Foukes Spur, West's lake	100
Frankston, Myrtle Hedge Lake	75
Thompson's lake	50
Fulshear, Mayes Lake	50
Gainesville, Gravel Lake	50
Gun and Rod Club Lake	50
Whaley Lake	50
Garrison, Earl Lake	50
Gilmer, Lake Glenwood	100
Myrtle Pond	100
Girvin, Baker Lake	25
Gladewater, Phillips's lake	50
Goodnight, McCullum Pond	50
Grand Saline, Bryant's pond	25
Grandview, Nelson's pond	25
Watts's lake	25
Grapeland, Brimberry Lake	50
Darsey Lake	50
Elcaney Pond	50
Lively Lake	35
Myrtle Lake	100
Spring Pond	50
Tyer's lake	50
Walling's pond	40
Greenville, Looney Lake	75
McComes's lake	50
Hallville, Richardson's pond	50
Henderson, Benner Lake	75
Brown Lake	100
Graham Lake	75
Kelley's pond	50
Lake Ctim	25
Lake Hallwood	50
Lake Moss Inn-out	50
McCord Lake	75
Seliks Sound Lake	50
Valley Lake	50
Willow Lake	75
Henrietta, Lake Henrietta	50
Honey Grove, Spence's pond	50
Hubbard, Buffalo Pond	50
Cotton Belt	50
Doner Branch Pond	100
McGuffey's pond	50
Matson Pond	100
North Pin Oak Pond	50
Pin Oak Pond	50
Hutchins, Dallas Club Lake	200
Jacksonville, Douglas Lake	50
Justiceburg, Kildugare Pond	50
Kaufman, Bois d'Arc Lake	50
Cane Brake Lake	100
Texas—Continued.	
Kaufman, Carter Lake	50
Cartwright Lake	50
Churchill Lake	100
Club Lake	50
Ellis Lake	50
Fox's pond	50
Gilmore Pond	50
Hatch Lake	50
Hicks's pond	50
Miller's pond	50
West Pond	50
Kemp, Berry Lake	75
Blaze Lake	75
Kemp Berry Lake	75
Kerrville, Bear Creek	100
Burnett Lake	25
Crider Lake	50
Dowdy Pond	50
Gregory Pond	25
Guadalupe River	150
Lackey Pond	50
Louis Lake	25
Palmer Lake	25
Tegner Creek Pond	25
Kildare, Moore Lake	50
Kilgore, Elder's pond	50
Rowland's pond	50
Ladonia, Bishop's pond	50
Laredo, Ross's pond	50
Willow Pond	50
Wormser Pond	50
Lillian, Thompson Lake	100
Livingston, Magnolia Lake	50
Lockhart, Chew's pond	50
Longview, McQueen's pond	100
Lovelady, Smith's pond	50
Lufkin, Lake Kathryn	50
O'Quinn's pond	25
McConnell, Mathews's pond	50
McKinney, Sloan Creek	200
Mabank, Adam's pond	25
Dellis's pond	50
Gray's pond	50
Osborn's pond	25
Marfa, Blue Mountain Pond	50
Marshall, Anchorage Farm Pond	25
Cook's pond	25
Henrietta Lake	50
Round Lake	100
Memphis, Sparks Lake	50
Menard, Las Moras Creek	100
Matthews Lake	50
Mission Lake	50
Rocky Creek	50
San Saba River	100
Meridian, Bosque River	225
Mertzon, Callison Lake	25
Ohoshe Lake	50
Stage Stand Lake	25
Mesquite, Duff Lake	25
Midland, Railey's pond	25
Millet, Fisher's pond	50
Mineola, Cage's pond	50
Charter Club Lake	50
Fause's pond	50
Glade Lake	50
Sabine Lake	50
Wells Lake	60
Mineral Wells, Corn's lake	50
Elm Creek	50
Elmhurst Lake	50
Oaks's pond	50
Mount Selma, Dublin's lake	50
White Perch Lake	50

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

CRAPPIE—Continued.

Disposition.	Finger-lings, yearlings, and adults.
Texas—Continued.	
Nacogdoches, Blount's Lake	50
Fair Lake	50
Hardeman's pond	25
Lake Alazon	50
Loco Lake	50
Rose Lake	50
New Boston, Burrows Lake	50
New Braunfels, Guadalupe River	150
Newsome, Clear Lake	50
Lain's pond	25
Nelson Lake	25
Ovalo, Ovalo Lake	50
Paige, South End Pond	50
Palestine, Bear Lake	50
Bowen Pond	50
Broughton's pond	25
Colley Lake	25
Reece's pond	25
Sand Lake	25
Smoots Lake	50
Spring Park Lake	100
Panhandle, Antelope Creek	100
Paris, Broad's lake	50
Gordon Club Lake	100
Hodges's pond	50
Johnson Lake	50
Long Pond	25
Oneta Lake	50
Pride Pond	25
Tanglewood Pond	25
Turner's pond	25
Williams's pond	25
Petty, Henderson Lake	50
Pinehill, Camp's pond	50
Osborne's pond	50
Smith's pond	50
Willow Pond	50
Pittsburg, Lily Pond	25
Moors Lake	50
Rope's pond	25
Plainview, Allen's pond	25
Woodson's pond	25
Queen City, Hanes's pond	50
Queen City pond	25
Ranger, Hagaman Lake	100
Redwater, Clear Lake	150
Rochelle, Sellman Lakes	50
Rockdale, Lee's pond	50
Rotan, Kennedy's pond	50
San Angelo, Concho River	100
South Concho River	100
San Augustine, McDaniel's pond	50
San Marcos, Jackman Lake	100
San Saba, San Saba River	150
Santa Anna, Grady's lake	25
Kelley Lake	25
Newman Lake	25
Scurry, Dees Lake,	50
Hicks's pond	50
Nash's lake	50
Sherman, Seven Mile Lake	50
Snyder, Big Pond	25
Daniel's pond	25
Spofford, Slater's pond	50
Stamford, Rock Rib Lake	150
West Lake	140
Strawn, Ioni Creek	100
Swenson, Ward's pond	50
Terrell, Atcheson's pond	25
Charlton Pond	25
Griffith Pond	50
Martin Pond	25
Rose Hill Pond	25
Texarkana, Bittle's pond	100
Texas—Continued.	
Thorndale, Felton Lake	50
Tinpson, Garrison Lake	50
Greens Lake	50
Smith's lake	50
Weaver's pond	50
Troup, Kee's pond	30
Martin's pond	30
Truscott, Pebble Pond	25
Tyler, Brumby Lake	50
Burleson Lake	50
Chinquapin Lake	50
Hamilton Mill Pond	50
Hills Lake	50
Hitts Mill Pond	50
Saline Creek	325
Silver Spring Lake	25
Uvalde, Gibben's pond	50
Turkey Creek	50
Valera, Home Creek	25
Vernon, Lake Vernon	50
Old Trail Pond	50
Waco, Standefer's ponds	100
Weatherford, McFarlan's pond	50
Winona Lake	50
Whitewright, Pilot Grove Creek	100
Wichita Falls, Floral Lake	25
Horseshoe Lake	100
Lake Staniforth	25
Willis, Forest Lake	50
Pine Park Lake	50
Wills Point, Thompson Lake	25
Willow Lake	25
Winnsboro, Kyle's pond	25
Lake Erie Club Pond	25
Winters, Water Works Lake	100
Yoakum, Kelleys Creek	100
Virginia:	
Blackstone, Maben's pond	30
Carson, Indian Swamp Pond	60
Danville, Dan River	60
Sandy River	90
Wolf Island Creek	90
Granite, Pond C	30
Petersburg, Harrison Pond	150
Hosee Pond	300
Roper's pond	150
Plains, Goose Creek	300
Providence Forge, Providence Forge Pond	60
Richmond, Dearhardt Pond	300
Sweet Hall, Cooks Mill Pond	150
Stony Creek, Sappony Creek Pond	300
Suffolk, Pruden's pond	60
Waterlick, Passage Creek	650
West Virginia:	
Surveyor, Clay's pond	200
Wisconsin:	
Amery, Clare Lake	300
Round Lake	300
Baldwin, Balsam Lake	300
Birchwood, Bennett Lake	300
Little Sissibagama Lake	300
Spring Lake	300
Birnamwood, Lake Go To It	400
Long Lake	400
Butternut, Pelican Lake	300
Cable, Cable Lake	250
Rosa Lake	250
Centuria, Deer Lake	250
Long Lake	250
Sand Lake	250
Comstock, Crystal Lake	250
Harshaw, Bass Lake	200
Champion Lake	200

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

CRAPPIE—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.	
Harshaw, Floy Lake	200
Iowa Lake	200
Onida Lake	200
Oscar Jennie Lake	200
Haugen, Devils Lake	300
Tuesday Lake	300
Independence, Bugle Lake	250
New City Pond	250
Kewaskum, Beechwood Lake	400
Lake Seven	400
La Crosse, French Lake	3,000
Mississippi River	347,500
Rice Lake	1,000
Round Lake	1,000
Lynxville, Mississippi River	300,000
Milwaukee, Big Muskego Lake	400
Mosinee, Short Portage Lake	400
New Richmond, Apple River	250
Squaw Lake	250
Sweede Lake	250
Nye, Round Lake	300
Reserve, Court d'Oreille Lake	300
Roberts, Dry Lake	300
Sayner, Plum Lake	600
Razor Back Lake	600
Wisconsin—Continued.	
State Line, Little Pickerel Lake	400
Loon Lake	500
Stone Lake, Flat Lake	250
Little Sissibagama Lake	250
Little Stone Lake	250
Pickwick Lake	250
Sand Lake	250
Slim Lake	250
Stone Lake	250
Three Lakes, Thunder Lake	400
Tomahawk, Half Moon Lake	200
Somo River	200
Spirit River	200
Tomahawk River	200
Twin Lakes	200
Wisconsin River	200
Turtle Lake, Hillman Lake	250
Horseshoe Lake	250
Skinnaway Lake	250
Upper Turtle Lake	250
Wyoming:	
Cheyenne, Lake Minnehaha	300
Sloans Lake	600
Total[a]	1,800,430

STRAWBERRY BASS.

Disposition.	Fingerlings, yearlings, and adults.
Illinois:	
Meredosia, Meredosia Bay	20
Kansas:	
Edwardsville, Forest Lake	400

ROCK BASS.

Disposition.	Fingerlings, yearlings, and adults.
Alabama:	
Brent, Wyatt's pond	200
Camden, Bonner's pond	100
Miller Creek	100
Hanceville, Mulberry Creek	500
Kellyton, Porch's pond	250
Ozark, Cotten's pond	200
Rendalia, Riser's pond	200
Russellville, Bowen's pond	200
Burgess Lake	200
Burgess Pond	200
Cobb Lake	150
Lake Gayley	400
Talladega, Jones's pond	150
Talladega Creek	300
Arizona:	
Hereford, Martin's pond	200
Arkansas:	
Clarksville, Herring's pond	200
Fayetteville, White River	3,000
Fort Smith, Morris's pond	1,000
Guernsey, McIver's pond	200
Gurdon, Marion Lake	16,000
Harrison, Hudson's pond	100
Imboden, Rider's lake	8,000
Jacksonville, Stanley's pond	20,000
Magnolia, Hutcheson's pond	20,000
Mammoth Spring, Big Creek	20,000
Janes Creek	20,000
Myatt River	30,000
Spring River	105,000
Tracy Creek	13,400
Warm Fork River	13,500
Waters Fork	20,000
Many Islands, Myatt River	1,000
Arkansas—Continued.	
Ozan, Goodlett's pond	16,000
Pocahontas, Chastain's pond	4,000
Schaal, Crystal Pond	16,000
Star City, Grumbles's pond	400
Waldo, Reason's pond	12,000
Connecticut:	
Newington, Goodwin's pond	78
Delaware:	
Wilmington, Carpenter's pond	200
Florida:	
St. Cloud, Lake East Tohopekaliga	400
Georgia:	
Bullochville, Davidson's pond	100
Crawfordville, Holden's pond	200
Tyrone, Landrum's pond	200
White Plains, Humphrey's pond	200
Tappan's pond	200
Winder, Shields's pond	200
Zirkle, Little Satilla River	800
Illinois:	
Meredosia, Meredosia Bay	25
Indiana:	
Morris, Bischoff's pond	400
Iowa:	
Chariton, Crystal Lake	100
Humeston, Williams's pond	50
Kansas:	
Columbus, Lagoon No. 2	200
Kansas City, Poor Farm Lake	600
Wichita, Little Arkansas River	300
Kentucky:	
Augusta, Bracken Creek	100
Campbellsburg, Taylor's pond	100
Dover, Minerva Pond	100

[a] Lost in transit, 3,542.

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

ROCK BASS—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Kentucky—Continued.	
Eminence, Helburn's pond	250
Franklin, May Branch	100
Mayes's pond	100
Spring Pond	100
Stewart's pond	100
Henderson, Meadow Pond	100
Illsley, Six Lakes	100
Jackson, Kentucky River	500
Jeffersontown, Starks Pond	300
London, Raccoon Creek	400
Madisonville, Patterson's pond	100
Maysville, Hunters Pond	100
Williams's pond (A)	100
Williams's pond (B)	100
Olmstead, Whippoorwill Creek	100
Paris, Big Pond	600
Wyatt's pond	600
Pembroke, Barker's pond	100
Peytontown, Mason's pond	200
Pikeville, Big Sandy Pond	100
Richmond, Silver Creek	500
Stanford, Fish's pond	300
Proctor's pond	300
Stanford Lake	300
White Villa, Lake White Villa	250
Winchester, Dooley's pond	200
Howards Upper Creek	500
McCormick's pond	350
Yarnallton, Drake's pond	200
Louisiana:	
Gibbsland, Wall's pond	25
Loze, Derouen's pond	25
Opelousas, Chachere's pond	2,000
Maryland:	
Rising Sun, Freeman's pond	200
Massachusetts:	
Greenfield, Long Pond	75
Mississippi:	
Aberdeen, Athens Creek	500
Bartohatchee River	500
Basham Creek	200
Black Pond	100
Halfway Creek	500
Ethel, Kennedy's pond	100
Jackson, Wiggins's pond	100
Lauderdale, Bond's pond	100
Louisville, Harris's pond	100
Mize, Bryant's pond	100
Pheba, Crystal Pond	100
Pontotoc, Bigham's pond	400
Orchard Lake	400
Roxie, Hill Pond	100
Scooba, West Pond	100
Shuqualak, Darrah Pond	150
Hairston's pond	200
Starkville, Christopher's pond	150
Vaughan, Moore's pond	200
Missouri:	
Cabool, Indian Creek	1,000
Little Piney Creek	1,000
Koshkonong, Shady Nook Lake	500
Randolph, Sherwood's pond	200
Richland, Meadow Brook Pond	200
Rolla, Big Dry Fork River	800
Cave Spring Creek	800
Yancy Lake	400
Sparta, Morris's pond	300
Springfield, Clear Lake	300
Whalen's pond	100
New Mexico:	
Albuquerque, Beckham's pond	200
Ancho, Ancho Pond	600
Buchanan, De Graftenreid's pond	200
Carlsbad, Gaither's pond	200
Knowles's pond	200
New Mexico—Continued.	
Carlsbad, Willis's pond	200
Deming, Cobb's pond	200
Landauer's pond	200
Las Vegas, Chupainas Pond	300
Lordsburg, Hardin's pond	150
Melrose, Huntinger's pond	200
Mount Dora, Jacobs's pond	150
Naravisa, Du Bois's pond	300
Magrader's pond	150
Roswell, Hamilton Lake	400
Haymaker Lake	400
North Springs Lake	800
Robinson Lake	400
Urton Lake	800
Santa Rosa, Agua Negra Creek	500
Steins, Carlen's pond	150
McCant's pond	200
Taiban, Hall's pond	200
Tucumcari, Briscoe Pond	300
New York:	
La Grangeville, Beechmont Pond	65
Whitestone Landing, Ice Pond	1,050
North Carolina:	
Charlotte, Belleview Pond	400
Franklin, Cozad Power Dam	300
Ohio:	
Middlefield, Brookside Pond	100
Perry, Spring Pond	200
Upper Sandusky, Sandusky River	100
Washington Court House, Compton Creek	300
Oklahoma:	
Ada, Baringer Pond	210
Blanchard, Davis's pond	210
Duncan, Fullwood's pond	110
Elk City, Ballard's pond	834
Erick, Everett's pond	167
Holmberg's pond	167
Guthrie, Prairie Lake	210
Mangum, Cheek's pond	200
Mill Creek, Blue River	600
Nash, East's pond	132
Shawnee, Lone Elm Pond	210
Stonewall, Holcombe's pond	200
Woodward, Harpole's pond	400
Yukon, Carson's pond	100
Pennsylvania:	
Bryn Mawr, Darby Creek	400
Indiana, Fath Run	200
Lebanon, Mount Gretna Lake	200
Stoevers Pond	200
Stracks Pond	200
Water House Lake	400
Listie, Silver Lake	325
Reading, Manatawny Creek	2,800
Williamsport, Susquehanna River, West Branch	1,825
Porto Rico:	
Guyayama, Pattillas Reservoir	1,200
South Carolina:	
Enoree, Enoree River	1,000
Greenville, Hood's pond	200
Honea Path, Cannadays Branch	300
Reeds Branch	500
Jonesville, Floyd's pond	300
Laurens, Raburn Creek	1,000
Waterloo, Harror Pond	200
South Dakota:	
Eagle Butte, Green Grass Creek, branch of	300
Winner, Dahl's pond	275
Tennessee:	
Erwin, North Indian Creek	3,000
Fordtown, Maple Pond	175
Hickory Valley, Pabst's pond	70

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

ROCK BASS—Continued.

Disposition.	Fingerlings, yearlings, and adults.
Tennessee—Continued.	
Knoxville, Byron Blue Pond	200
Tennessee River	5,000
Madison, Madison Branch Pond	600
Newbern, Wild Rose Pond	80
Spring City, Town Creek	400
Vans Creek	300
Wartrace, Alley Pond	600
Texas:	
Alpine, Kirby Pond	50
Mitre Peat Pond	75
Benjamin, Canyon Lake	100
Brenham, Brenham Club Lake	150
Morgan's pond	100
Stone Lake	100
Clarksville, Latimer's pond	75
Del Rio, Charco Lake	75
Cienegas Creek	75
Devils River	150
Pinto Creek	150
San Felipe Creek	150
Denison, Randell Pond	150
Waterloo Pond	150
Detriot, Coursey's pond	50
Dollins's pond	50
Norris's pond	50
Fort Stockton, Johnson's pond	50
Greenville, Poole's pond	40
Hillsboro, Givens's pond	50
Reunion Lake	50
Hondo, Steigler's pond	100
Itasca, Cotton Mill Reservoir	50
Jacksonville, Boles Lake	50
Jones Lake	50
Westleigh Lake	50
Katy, Joe Eagle Pond	50
Kerrville, Browne's pond	65
Clark Pond	65
Cypress Creek	130
Hope's pond	130
Texas—Continued.	
Kerrville, Raaz Pond	65
Starkey Lake	65
La Grange, Lake Gilbert	50
Lampasas, Abney's pond	50
Mertzon, Callison's pond	50
Paris, Oneta Lake	50
Sabinal, Mathews's pond	100
Snyder, Davis's pond	50
Fullilove's pond	100
Harliss's pond	175
Standart, Hudson Lake	100
Thorndale, Heintze's pond	100
Tyler, Willow Lake	50
Waco, Ozburn's pond	75
Virginia:	
Beaver Dam, Bartlett's pond	200
Chase City, Terry's pond	200
Christiansburg, Orchard Lake	200
Louisa, Glen Mary Pond	400
Maiden, Lewis's pond	200
Pamplin, Horse Pen Mill Pond	500
Red Hill, Wingfield's ice pond	400
Vienna, Cooley's pond	300
Waverly, Niblett Mill Pond	600
Wirtz, Gills Creek	1,000
Wytheville, Reed Creek, South Fork	400
Tates Run	400
West Virginia:	
Bluefield, Bailey Lake	100
Martinsburg, Opequon Creek	1,000
Potomac River	1,700
Sturgisson, Quarry Lake	200
Walkersville, Monongahela River, West Branch	600
Wisconsin:	
Leslie, Pecatonica River, branch of	350
Total [a]	414,078

SMALLMOUTH BLACK BASS.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Arkansas:		
Brentwood, White River, West Fork		600
Crossett, Creamery Lake		600
Fayetteville, White River, Middle Fork		500
Hardy, Spring River	6,000	16,000
Hope, Pleasure Lake		600
Hot Springs, Bulls Creek, North Fork	6,000	
Burton Branch	6,000	
Little Mazarn Creek	6,000	
Mill Creek	6,000	
Teger Creek	6,000	
Johnson, Taylor Lake		200
River Front, St. Francis River	12,000	
St. Francis, St. Francis River	30,000	
St. Francis Bridge, St. Francis River		800
Colorado:		
Denver, Alchemist Springs Ponds		200
Page Lake		200
Delaware:		
Felton, Killens Pond		400
Illinois:		
Barstow, Rock River	2,500	
Iowa:		
Chester, Upper Iowa River		500
Cresco, Little Iowa River		500
Kentucky:		
Bowling Green, Gasper River	9,000	
Cadiz, Birds Creek	6,000	
Caney Creek	6,000	
Casey's Creek	6,000	
Donaldson Creek	6,000	
Little River	9,000	
Little River, Upper	6,000	
Muddy Fork Creek	9,000	

[a] Lost in transit, 6,225.

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

SMALLMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Kentucky—Continued.		
Cadiz, Saline Creek	6,000	
Sinking Fork Creek	6,000	
Clermont, Echo Spring Lake	6,000	
Crab Orchard, Dix River	9,000	
Danville, Dix River	9,000	
Dix River, Hanging Fork	6,000	
Mocks Run	9,000	
Railroad Pond	6,000	
Salt River, Rolling Fork	15,000	
Elizabethtown, Mill Creek	9,000	
Nolin River	12,000	
Woolperts Pond	3,000	
Frankfort, Cedar Creek	9,000	
Glasgow, Fallen Timber Creek	9,000	
Hopkinsville, Little River, East Fork	9,000	
Little River West Fork	6,000	
Lawrenceburg, Big Pond	3,000	
Maceo, Kingfisher Lake	6,000	
Pembroke, Red River, West Fork	9,000	
Princeton, Hollingsworth Creek	3,000	
Shelbyville, Guthrie's pond	3,000	
Maine:		
Bowdoinham, Adams's pond	1,000	
Oakland, Belgrade Lake	3,200	
Maryland:		
Alberton, Wheelwright's pond		200
Antietam, Potomac River		200
Cumberland, Flintstone Creek	9,000	
Potomac River	12,000	
Massachusetts:		
Gloucester, Niles Pond	1,500	
Great Barrington, Lake Buel	1,100	
Lee, Greenwater Pond	2,000	
Laurel Lake	1,000	
Lower Goose Pond	1,000	
Shaw Pond	3,000	
Stockbridge Lake	6,000	
Upper Goose Pond	1,000	
Lowell, Burges Pond	1,000	
Crystal Lake	1,000	
Flushing Pond	2,000	
Knopps Pond	1,000	
Massacupis Lake	4,000	
Nabnassett Pond	1,000	
Lynn, Lower Pond	1,500	
Williamsville, Hemingway Pond	1,000	
Worcester, Coes Pond	3,000	
Michigan:		
Alden, Clam Lake		840
Buchanan, Clear Lake		900
Charlevoix, Adams Lake		630
Pine Lake		420
Clyde, Fish Lake		600
Highfield's pond		400
Dunham, Lake Chaney		180
East Tawas, Bass Lake		600
Edwardsburg, Eagle Lake		1,000
Evart, Hicks Lake		800
Ypsilanti, Frains Lake		400
Grayling, Portage Lake		1,100
Holly, Simonson Lake		400
Jackson, Big Portage Lake		1,000
Leonard, Echo Lake	1,000	
Long Lake, Bijou Lake		800
Lovells, Shoe Pack Lake		800
Michigan—Continued.		
Muskegon, Wolf Lake		800
Niles, Smiths Lake		1,800
Northville, Walled Lake	1,000	
Oscoda, Lake Van Etta		1,000
Owosso, Shawassee River		1,000
Quimby, East Lake		400
Long Lake		400
Lower Lake		300
Middle Lake		400
Mixer Lake		300
Myers Lake		300
Newton Lake		800
Tanner Lake		300
Tilson Lake		300
Twin Lake		300
Reading, Carpenter Lake		300
Long Lake		450
Round Lake		450
Reed City, Todd Lake		600
St. James, Barney Lake		420
Egg Lake		420
Font Lake		630
Fox Lake		420
Lake Gallier		630
Turtle, Bear Lake		90
Clearwater Lake		90
Hawk Lake		90
Honeymoon Lake		90
Independence Lake		180
Little African Lake		90
Long Lake		180
Ormes Lake		90
Rowe Lake		90
Twin Lake, Twin Lake		800
Walhalla, St. Anthony Lake		400
Minnesota:		
Hokah, Broken Arrow Run		375
Mississippi:		
Aberdeen, Jones's pond		100
Avon, Lake Shepherd	12,000	
Missouri:		
Horse Hollow, Alley Spring Run	3,000	
Marceline, Santa Fe Club Lake		180
New Hampshire:		
Antrim, Gregg Lake	2,000	
Canobie Lake, Canobie Lake	550	
Claremont, Cold Pond	3,000	
Concord, Contoocook River	2,000	
Keene, Spofford Lake	3,000	
New York:		
Cambridge, Hedges lake	1,000	
Lake Lauderdale	1,000	
School House Pond	1,000	
Gloversville, Canada Lake		75
East Stink Lake		50
Green Lake		75
Helen Gould Lake		75
Henrietta Creek		75
Mayfield Creek		75
Stink Lake		50
West Lake		75
West Canada Lake		75
Greene, Echo Lake		150
Mount Calm Landing, Eagle Lake		50
Port Henry, Deadwater Lake	1,000	
Lake Wawonaissa	2,000	
Ledge Lake	1,000	

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

SMALLMOUTH BLACK BASS.—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
New York—Continued.		
Salem, Cossayuna Lake	1,000	
Schenectady, Ballston Lake		50
Brandywine Pond		75
Featherstonhaugh Lake		75
North Carolina:		
Connelly Springs, Cannon Creek		150
Cold Water Creek		150
Draper, Pumpkin Creek		300
High Point, Holts Creek		200
Lake Toxaway, Lake Toxaway		600
Lenoir, Wilson Creek		750
Marion, Catawba River		400
North Dakota:		
Bottineau, Lake Metegoshe		300
Sykeston, Lake Hiawatha		200
Ohio:		
Akron, East and West Reservoirs	2,000	
Springfield Lake	2,000	
Holmesville, Martins Creek	500	
Mansfield, Clear Fork River	1,000	
Ravenna, Lake Hodgson	1,200	
Lake Stafford	1,200	
Sycamore, Sycamore Creek	2,000	
West Alexandria, Twin Creek		1,600
Pennsylvania:		
Atglen, Glenville Pond		150
Birdell, Birdell Pond		200
Great Bend, Quaker Lake		45
Hatboro, Neshaminy Creek		150
Lebanon, Alberts Mill Pond		100
Klines Pond		100
Lights Pond		100
Mishs Pond		100
Sarges Mill Pond		100
Valley Glen Pond		100
Weidmans Pond		100
Weimers Pond		100
Norristown, Perkiomen Creek		300
Peach Bottom, Susquehanna River		300
Phillipsburg, Delaware River		450
Ship Road, Brandywine Creek		150
Ship Road Pond		150
Spring City, French Creek		150
Frogtown Pond		150
Rapps Pond		150
Telford, Branch Creek		150
South Carolina:		
Welford, South Tiger River		300
Tennessee:		
Blevins, Doe River		300
Clarksville, Big West Fork Creek	12,000	
Flat Lick Creek	6,000	
Little West Fork Creek	12,000	
Trahern's lake	6,000	
Cleveland, Wildwood Lake (A)	6,000	
Wildwood Lake (B)	6,000	
Wildwood Lake (C)	6,000	
Estill Springs, Elk River	12,000	
Hickory Valley, Pabst's pond		800
Johnson City, Watauga River	400	
Tennessee—Continued.		
McMinnville, Rocky River		8,000
Mitchellville, Gossetts Pond	3,000	
Sequatchie, Little Sequatchie River	9,000	
Springfield, Red River, South Fork	9,000	
Tellico Plains, Tellico River	9,000	
Utah:		
Logan, Clear Creek		50
Vermont:		
Cambridge Junction, Half Moon Pond		75
Medcalf Pond		75
Enosburg Falls, Lake Carmi		75
Fair Haven, Black Pond		41
Hydeville, Lake Bomoseen	1,000	75
Middlebury, Fern Lake		75
Otter Creek		150
Morrisville, Lake Lamoille		50
Mount Holly, Jackson Pond		43
North Bennington, Lake Paran		75
Rupert, Lake St. Catherine	1,000	
Springfield, Lower Mucktow Pond	270	80
Wolcott, Wolcott Pond		75
Virginia:		
Abingdon, Holston River, South Fork		300
Afton, Rockfish River		400
Amelia, Southland Pond		100
Boyce, Millwood Run	1,500	250
Chester, Red Water Lake		100
Covington, Potts Creek	9,000	
East Radford, Back Creek		300
Little River		350
Ellerson, Fox's pond		200
Rutland Club Lake		238
Front Royal, Gooney Run	4,500	
Ironton, Roanoke River	8,000	
Lightfoot, Jolly Mill Pond		200
Manassas, Occoquan Run		200
Norfolk, City Lake		200
Pocahontas, Carrs Spring Branch		100
Shenandoah, Shenandoah River		1,100
Stanley, Shenandoah River, South Branch	6,000	
Tunstalls, Cosbys Pond		200
Hampstead Pond		200
Warren, Marbrook Lake		100
Woodstock, Shenandoah River, North Branch	12,000	
Witheville, Cove Creek		200
Reed Creek		300
Reed Creek, North Branch		250
West Virginia:		
Berkeley Springs, Sleepy Creek	7,500	
Charles Town, Shenandoah River	12,000	260
Fairmont, Tygarts Valley River	9,000	
Great Cacapon, Great Cacapon River	9,000	
Keyser, Pattersons Creek	6,750	
Paw Paw, Great Cacapon River	12,000	300
Putney, Coal Company Lake	12,000	

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

SMALLMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
West Virginia—Continued.		
Romney, Potomac River, South Branch	12,000	600
Shelton, Elk River	12,000	
Springfield, Potomac River, South Branch	9,000	300
Wellsburg, Buffalo Creek	9,000	
Cross Creek	9,000	
Wisconsin:		
Amery, Blake Lake		180
Round Lake		180
Ashland, Basswood Lake		90
Buck Hill Lake		90
Duck Lake		90
Everett Lake		90
Finger Lake		90
Island Lake		90
Pike Lake		90
Twin Lake		90
White River Pond		90
Athelstane, Lily Lake	1,000	
Baldwin, Sucker Lake		180
Birnamwood, Circle Lake		90
Lake Go To It		90
Schmidt Lake		90
Spring Lake		90
Toad Lake		180
Butternut, Butternut Lake		90
Turtle Lake		90
Cable, Cable Lake		180
Perry Lake		90
Drummond, Lake Owen		90
Pigeon Lake		90
Robinson Lake		90
Elcho, Bass Lake		180
Enterprise Lake		270
Otter Lake		180
Pine Lake		90
Glidden, Augustine Lake		90
Summit Lake		90
Wisconsin—Continued.		
Hayward, Bass Lake		90
Big Moose River		90
Big Spider Lake		90
Blueberry Lake		90
Clear Lake		90
Lake Court O'Reille		180
Little Moose River		90
Little Spider Lake		90
Round Lake		90
Lake Nebagamon, Lake Nebagamon		215
Mellen, Lake Gallilee		90
Long Lake		90
Mineral Lake		90
Nashville, Little Ice Lake		90
Mole Lake		90
Norrie, Mayflower Lake		90
Nye, Big Lake		180
Pelican, Buteau Lake		90
Long Lake		180
Pelican Lake		180
Phelps, Little Twin Lakes		90
Presque Isle, Presque Isle Lake		180
State Line, Beaver Lake		90
Big Portage Lake		90
Black Lake		180
Dinner Lake		180
Fawn Lake		180
Lost Lake		90
Marshall Lake		90
Silver Lake		90
Spoon Lake		180
Tamarack Lake		90
Sweden, Bass Lake		90
Black Lake		90
Mac-a-nin-ny Lake		90
Starr Lake		90
Total [a]	653,170	81,177

LARGEMOUTH BLACK BASS.

Alabama:		
Anderson, Batson's pond		750
Birmingham, Clark's pond		1,500
Edwards's pond		1,500
Giles Pond		1,200
Lake Aleathea		1,775
Mountain Lake		300
Number Seven Lake		1,200
Oliver's lake		1,500
Phillips's pond		100
Riddle's pond		1,000
Ritter's pond		2,000
Scotts Branch Pond		1,200
Village Creek Reservoir		275
Warren Lake		1,500
Brent, Affonee Creek		50
Ellard's pond		25
Haysop Creek		200
Highland Lake		200
Brewton, Burnt Corn Creek		2,000
Brierfield, Mahan Creek		1,000
Centerville, Avery Lake		8,000
Cooper's pond		8,000
Lightsey Pond		8,000
Alabama—Continued.		
Coleanor, Fancher's mill pond		200
Mahan Creek		200
Cordova, Black Warrior River		1,200
Courtland, Big Nance Creek		300
Spring Creek		100
Crews, Goode Spring Pond		200
Decatur, Beaver Lake		200
Dixon Mills, Dixon Mill Pond		1,000
Epes, Godfrey's pond		1,000
Erin, Three Mile Creek		1,000
Eutaw, Dollarhide Pond		1,000
Evergreen, Muder Creek		2,000
Smith's pond		1,750
Fayette, Sipsey Lake		225
Sipsey River	7,500	
Florence, Smith's lake	7,500	
Striplin's lake	2,500	
Geiger, Gallespier Lake	2,500	
Geiger Lake	5,000	
Gillespie Pond	2,500	
Hirshfield Lake	5,000	
Porter's pond	2,500	
Table Lake	5,000	
Grassmere, Clear Creek		500
Green, Cunningham Creek		1,500
Guin, Pearce's pond	2,500	

[a] Lost in transit, 28,250 fry and 2,124 fingerlings.

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Alabama—Continued.		
Hanceville, Mulberry Creek		400
Harvest, Limestone Creek		30
Hodges, Fleming's pond		100
Hull, Big Sandy Pond		120
Huntsville, Indian Creek		200
Ida, Campbell Lake		200
Coosa Lake		200
Lock Twelve Lake	75,000	400
Mud Creek Lake		200
Jasper, Bankhead's pond		1,500
Blackwater Creek		1,800
Cane Creek		300
Kellyton, Hatchet Creek		300
Letohatchee, Dean's pond		750
Holmes Lake		1,000
Lineville, Lake Sallie Woodie		500
Smith's lake		500
Loachapoka, Sougahatchee Pond		1,000
Luverne, Beall's lake		200
Kendrick's pond		100
Reynold's lake		100
Ruff's pond		100
Sikes's pond		100
McElderry, Cheaha Creek		250
Marion, Dunaway's pond		1,000
Melborne, Hays's pond	2,500	
Mobile, Dog River		2,000
Montgomery, Big Whitewater Lake		3,000
Cobbs Ford Lake		200
Crescent Lake		2,000
Whetstone Lake		1,500
Mosteller, Beeswax Creek		300
Coosa River Lake		300
New Market, Mountain Fork Creek		100
Oneonta, Sand Lake		200
Paint Rock, Paint Rock River		300
Pelham, Johnson Creek		1,200
Phil Campbell, Lambert's pond		150
Pine Hill, Bradford's pond		1,000
Sheffield's pond		1,000
Prattville, Bell's pond		200
Dunn's pond		200
Northington's pond		100
Smith's pond		200
Pyriton, Pace's pond		1,000
Quenton, Bankhead Pond		2,000
Reimer, Beasley's ponds		200
Roanoke, Kitchen's pond		500
Russellville, Burgess's pond		100
Lake Gayley		300
Lake Henry		250
Selma, Jones's pond		1,000
Shady Grove, Hicks Pond		100
Sheffield, Shoal Creek		1,000
Sweetwater Creek		1,000
Sulligent, Bogue Pond		3,000
Priddy's pond		150
Talladega, Autreys Pond		500
Bartleson Pond		1,000
Chehawhaw Creek		1,500
Eastaboga Creek		500
Kellys Creek		500
Kershaw Branch		500
Pond Springs Branch		1,000
Silver Lake		1,500
Talladega Springs, Cedar Creek		400
Alabama—Continued.		
Talladega Springs, Heaslet Creek		200
Kirkland Lake		200
Peckerwood Creek		400
Pope Creek		200
Rock Lake		200
Vardeman Lake		200
Varner Mill Pond		200
Troy, Henderson's pond		100
Ten Acre Lake		300
Tuscaloosa, Quarles Lake		25
Tuscumbia, Spring Creek		1,000
Uniontown, Cromer's lake		2,000
Meadow Lake		3,000
Wagar, McClures Mill Pond		1,000
Walker Springs, Whites Pond		1,000
Winfield, Mill Race Lake		225
Yolande, Turner's pond		120
Arizona:		
Grand Canyon, Reed's lake		270
Wickenburg, Hassayampa River Pond		100
Yuma, Colorado River		300
Arkansas:		
Alma, Big Clear Creek	12,000	
Douglas Lake	9,000	
Frog Bayou	12,000	
Arkadelphia, Ouachita River	12,000	
Austin, Crabtree Spring Pond		150
Batesville, Blue Creek		300
Spring Creek		200
Spring Lake		500
Beaver, White River		6,000
Biggers, Current River		4,000
Booneville, Sanatorium Lake	6,000	
Buena Vista, Tyson's pond		4,000
Cotter, White River, North Fork		500
El Dorado, Rock Island Lake		125
England, Clear Lake	9,000	2,000
Fairfield, Atkins Lake	9,000	
Farrell, Farrell Pond		4,000
Fayetteville, Clear Creek	6,000	300
Hamestring Creek		200
Richland Creek		6,000
White River, Main Fork	9,000	300
White River, Middle Fork	6,000	
White River, West Fork	9,000	300
Galloway, Hills Lake	6,000	
Valentine's lake	6,000	
Hardy, Spring River		400
Spring River, South Fork	9,000	394
Harrison, Crooked Creek		6,000
Hermitage, Ferguson's pond		4,000
Homan, Six Hundred Yard Lake	6,000	
Hope, Crystal Lake	6,000	
Pleasure Lake		300
Spring Lake		200
Hot Springs, Clear Creek	6,000	
Mazarn Creek	9,000	
Saline River, South Fork	9,000	
Johnson, North Clear Creek		4,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Arkansas—Continued.		
Lake Village, Lake Chicot	15,000	
Leslie, Cove Creek		300
Little Red River		8,000
Payton Creek		400
Luna, Lake Chicot	12,000	
Mandeville, Poco Lake		100
Mena, Jansen Park Lake	9,000	
Menasha, Duck Lake		200
Goose Lake		200
Menasha Lake		200
Mink Lake		200
Peach Bayou		200
Store Lake		200
Swan Lake		200
Monticello, Wilson Pond	3,000	
Wood Lake	6,000	
Morrillton, Holly Lake	3,000	
Ogden, Clear Lake	12,000	
Olvey, Patrick's pond		4,000
Ozan, Public Pond	3,000	
Ozark, Mulberry Creek	12,000	
Paris, Short Mountain Creek	6,000	
Patmos, Lafferty's lake		200
Pine Bluff, Dorris Lake	15,000	95
Pocahontas, Black River		4,000
Prairie Grove, Illinois River, Upper		400
Moores Creek		200
Ravenden, Janes Creek		3,000
Readland, Grand Lake	15,000	
Rison, Lake Rison	3,000	
River Front, St. Francis River	12,000	
Rottaken, Big Lake	12,000	
Clear Creek	9,000	
Fish Creek	6,000	
Pennington Bayou	6,000	
Wolf Bayou	6,000	
Russellville, Illinois River	9,000	
Scott, Bear Skin Lake	12,000	
Stamps, Bayou Badeau		300
Silver Maple Pond		2,000
Summers, Thurman's pond		100
Texarkana, Clear Lake	6,000	
Country Club Lake	9,000	
Hogan Lake	9,000	
Neill's lake	6,000	
Thornton, Thornton Pond		8,000
Urbanette, Mack's pond		100
Waldo, Reasons's pond	9,000	
Waldron, Freestone River	9,000	
Whelen, Reed's pond	3,000	
Womble, Edwards's pond		200
Wrightsville, Fourche Bayou	18,000	2,000
Grassy Lake	9,000	
Horse Shoe Lake	6,000	
Kuykendall Lake	6,000	
Lorance Creek	9,000	
Colorado:		
Arvada, Holliday's pond		15
Boulder, Ballard Lake		30
Beasley Lake		30
Haydens Lake		30
Springsteel Lake		30
Brandon, Chivington Pond		250
Colorado Springs, Prospect Lake		175
Denver, Armour Lake		30
Grand Junction, Gunnison River		32
Connecticut:		
Greenwich, Thompson's pond		40
Niantic, Dodge Lake		200
Cuba:		
Oriente, Las Indios Lake		1,000
Delaware:		
Broadkill, Angola Pond		200
Cheswold, Leipsic River		400
Claymont, Naaman Creek		400
Delaware City, Chesapeake and Delaware Canal		200
Felton, Coursey Mill Pond		200
Killens Pond		400
McColley Mill Pond		200
Murderkill River, headwaters		400
Nanticoke River, Northwest Fork		400
Harrington, McCauley's mill pond		200
Wilson Mill Pond		200
Kirkwood, Canal Lake		200
Middletown, Silver Lake		400
Milford, Chestnut Hill Pond		200
Griers Pond		300
Marshall's mill pond		300
Wilmington, Lumms Pond		400
Wyoming, Wyoming Pond		200
Florida:		
Bay Lake, Waldron Lake		200
Century, Palmore Pond		1,000
Compass Lake, Blue Pond		200
Davenport, Buckeye Lake		100
De Funiak Springs, Godwin Pond		200
King's lake		200
Lake De Funiak		300
East Lake, Lake Weir		500
Florence Villa, Lake Cannon		100
Lake Drane		200
Lake Eloise		200
Lake Fanny		100
Lake Hamilton		200
Lake Lucerne		100
Lake Mirror		100
Lake Rochella		100
Spring Lake		100
Graceville, Snell's pond		100
Jasper, Jumping Gulley Creek		500
Orlando, Huxtable's pond		500
Pensacola, Olive Springs Pond		100
Pomaria, Saratoga Lake		800
Quitman, Session Pond		200
St. Cloud, Lake East Tohopekaliga		500
Sorrento, Lake Lucie		200
Tallahassee, Silver Trout Lake		200
Georgia:		
Aaron, Gay's pond		1,000
Lanier's pond		1,000
Adel, Saddle Bag Pond		250
Adrian, Carter Pond		200
Alapaha, Fletcher's pond		1,000
Albany, Flint River		2,000
Kinchafoonee Creek		3,500
Muckafoonee Creek		1,000
Muckalee Creek		1,500
Ashburn, McKenzie's pond		1,000
Athens, Oconee River		450
Atlanta, Brookhaven Lake		1,500
Brown's pond		200
East Lake		1,800
Jester Mill Pond		200
Walker's pond		100
Augusta, Leitner's pond		275
Town Creek Pond		300

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Georgia—Continued.		
Austell, Sweetwater Creek		375
Bellville, Black Pond		1,000
Blue Ridge, Snake Nation Lake		100
Boston, Silver Lake		1,000
Box Springs, Lake Mohignac		1,800
Samokee Lake		300
Broxton, Lott's pond		100
Ricketson's pond		1,000
Strickland's pond		150
Buena Vista, Harts Pond		200
Hollywood Pond		1,500
Knowlton Mill Pond		200
Oochee Creek Pond		200
Cairo, Maxwell's pond		1,000
Canon, Rocky Fork Pond		400
Carrolton, Tallapoosa River		500
Cartersville, Euharlee Creek		300
Jones Mill Pond		300
Cedartown, Pumpkin Pile Creek		100
Coffee, Black Run		1,000
Columbus, Key's pond		300
Comer, Crystal Lake		1,000
Covena, Spring Water Pond		300
Crawfordsville, Ogeechee River		1,650
Dallas, Jones's pond		175
Dalton, Tibb's pond		100
Decatur, Snapfinger Creek		1,000
Denton, Roddenberry's pond		200
Douglas, Barber's pond	1,500	
Peterson's pond	1,000	
Smith's pond		1,000
Vickers Mill Pond	1,000	
Fairburn, McCurry's pond		500
Fayetteville, Whitewater Pond		300
Fort Valley, Houser's mill pond		750
Greensboro, Richland Creek		1,500
Griffin, Mary Villa Pond		140
Moores Branch		150
Hagan, Cedar Creek, branch of		750
Hardys Crossing, Jackson's mill pond		1,000
Harris, Bonner's pond		100
Higgston, Morris's pond		750
Hilltonia, Beaverdam Creek		1,250
Kibbee, Palmer's pond		750
Lake Park, Corbet Lake		200
Dyke Pond		200
Whitewater Lake		300
Lithonia, Arabia Mountain Lake		1,500
Reagin's pond		425
Louisville, Rocky Comfort Creek		300
Lumpkin, Patterson's mill pond		200
Mableton, Eason's pond		200
McBean, Knight's pond		500
Macon, Nelson Mill Pond		750
Stevens Lake		500
Willow Lake		1,500
Madison, Atkinson Lake		100
Maysville, Grove River Lake		200
Milledgeville, White Lake		750
Millhaven, Briar Creek		1,500
Milner, Buck Creek		100
Little Potato Pond		1,000
Georgia—Continued.		
Monroe, Roberts's pond		405
Montezuma, Beaver Creek		200
Newington, Meldrim Mill Pond		1,000
Norwood, Jones Pond		500
Ocilla, Paulk's pond		200
Ogeechee, Ogeechee River	2,000	
Pidcock, Frederick Pond		500
Quitman, Bowen Mill Pond		200
Foster Pond		500
Withlacoochee Creek		200
Reynolds, Horse Creek		3,000
Potterville Pond		750
Richland, Clear Creek		200
Rincon, Rincon Branch		750
Senoia, Adamson Pond		200
White Oak Creek		150
Smyrna, Nickajack Creek		200
Social Circle, Alcovy River		2,000
Lake Martha		500
Sparta, Mill Pond		175
Woodside Pond		1,000
Stephens, Sayer's pond		100
Stone Mountain, Yellow River		1,500
Sycamore, Fountain's pond		750
Thomasville, La Cubana Pond		1,000
Lake Katherine		100
Watson's pond		1,000
Toccoa, Scott's pond		100
Washington, Anderson Mill Pond		100
Upatoie, Pine Knot Creek		1,500
Valdosta, Bonny Mill Pond		1,000
Vidalia, Haskins Mill Pond		1,000
Warrenton, Beall's pond		200
Mathews Mill Pond		175
Waycross, Satilla River		4,000
Winona Park Lake		1,000
White Plains, Grime's pond		2,150
Whitestone, Talona Creek Pond		100
Winder, Apalachee River		200
Woodland, Flint River		200
Zirkle, Little Satilla River		2,000
Idaho:		
Roberts, Market Lake		150
Illinois:		
Aledo, Townsley's pond		120
Amboy, Maple Grove Pond		150
Antioch, Lake Catherine		600
Area, Chicago Club Lake		1,000
Avon, Avondale Club Lake		600
Belvidere, Kishwaukee River		400
Benton, Mine Pond		375
Troy Lake		125
Ward Lake		125
Bloomington, Heafers Pond		300
Carrolton, Elm Grove Pond		1,400
Chapin, Maple Park Pond		600
Clay City, Broken Hook Pond		200
Crystal Lake, Crystal Lake (A)		600
Crystal Lake (B)		450
Decorra, Evan's pond		150
Dietrick, Orchard Lake		300
Edwardsville, Wolf Pond		600
Elizabeth, Apple River		500
Farrington, Grassy Cove Lake		300
Flora, Lone Thron Lake		200
Maple Grove Pond		200
Franklin, Burlington Lake		600
Freeburg, Freeburg Lake		50

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Illinois—Continued.		
Freeport, Pecatonia River		250
Granite City, Atlasta Pond		400
Highland, Matter's lake		450
Highland Park, Foley's pond		150
Hillsboro, Chautauqua Lake		600
Edward's pond		200
Hinsdale, Salt Creek		600
Irving, Lyerla's pond		150
Lake Bluff, Brae Burn Pond		150
Lake Villa, Cedar Lake		800
Crooked Lake		800
Deep Lake		600
Libertyville, Insull's pond		600
Litchfield, Litchfield Reservoir		1,000
Long Lake, Long Lake		800
Loon Lake, Loon Lake		600
Markham, McKinney's pond		200
Meredosia, Meredosia Bay		55
Monmouth, Country Club Lake		180
Mount Pulaski, Salt Creek		450
Orleans, Spring Lake		200
Rigston, Rawling's pond		150
Roodhouse, C. and A. Pond		400
Round Lake, Round Lake		800
Salem, City Reservoir		1,600
County Home Pond		400
Savanna, Tomlinson Run		100
Sparta, Borders Lake		350
McKelvey's pond		175
Walsh Lake		350
Sterling, Lake Sinnissippi		750
Stronghurst, Lake Fort		150
Warren, Apple River		3,200
Indiana:		
Albion, Kuhns Lake		100
Bremen, Lake of the Woods		200
Donaldson, Gilbraith Lake		100
Elkhart, Elkhart River		100
Heaton Lake		100
Fremont, Lake George		150
Goshen, Wolf Lake		100
Ray, Clear Lake		100
Graveyard Lake		100
Kellogg Lake		100
Long Lake		100
Mud Lake		100
South Bend, Fish Lake		100
Topeka, Atwood Lake		100
Hackenburgh Lake		100
Long Lake		100
Pickerel Lake		50
Second Lake		100
Whitmer Lake		100
Iowa:		
Allerton, Allerton Pond		200
Rock Island Reservoir		80
Anamosa, Wapsipinicon River		360
Bellevue, Mississippi River		17,250
State fish commission		200
Chester, Upper Iowa River		240
Clinton, Goose Lake		120
Council Bluffs, Lake Manawa		120
Cresco, Upper Iowa River		120
Dyersville, Maquoketa River, North Fork		120
Fairbanks, Little Wapsie River		120
Independence, Wapsipinicon River		300
Iowa Falls, Iowa River		1,500
Iowa—Continued.		
Keokuk, Cooper Lake		120
North McGregor, Mississippi River		2,100
State fish commission		3,040
Ruthven, Lost Island Lake		300
Seymour, Seymour Pond		120
Webster City, Boone River		120
Kansas:		
Belleville, Belleville Lake		150
Chanute, Allen's lake		590
Cherryvale, City Lake		300
Fredonia, Brick company pond		100
Clear Creek		150
Fraters Lake		200
Gumbo Ponds		200
Rainbow Pond		100
Galena, Shoal Creek		100
Spring River		100
Hays, Kraus's pond		35
Kingman, Sutton's pond		100
Wrenchey's pond		100
Logan, Orchard Park Lake		100
Moran, Moran Pond		100
Neutral, Ransom's pond		200
Norton, Bittersweet Pond		240
Paola, Bull Creek		45
Parsons, Moran Pond		200
Pittsburg, Klaner Pond		200
Soldiers Home, Lake Jeanette		45
Welda, Welda Lake		545
West Mineral, Wayside Lake		200
Wichita, Little Arkansas River		45
Yates Center, Railway Pond		15
Kentucky:		
Adairsville, Herrings Pond		75
Holland Creek		75
Jenkins and Ryan Pond		150
Pleasant Grove Creek		75
Red River, North and South Prongs		150
Scruggs's pond		75
Sinking Creek		150
Allenville, Willow Pond		130
Barlow, Frey's lake		275
Beaver Creek, Big Sandy River		100
Bowling Green, Barren River		300
Clear Fork Creek		100
Curds Pond		200
Drakes Creek		200
Emerson's pond		100
Ford's pond		100
Green River		200
Kelly's lake		100
Murphy's pond		100
Trammell Creek		100
Trout Pond		100
Brandenburg, Allgood's pond		150
Bewley's pond		100
Brandenburg Lake		100
Brumer's pond		250
Horse Shoe Pond		250

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Kentucky—Continued.		
Brandenburg, Jennie Neafus Pond		250
Long Pond		100
Miller's pond (A)		150
Miller's pond (B)		100
Cadiz, Donaldson Creek		100
Hammond's pond		275
Campbellsburg, Cox's pond		125
Green River		100
Campton, Red River, Middle Fork		36
Cave City, Highland Pond		100
Centertown, Kimbley's pond		100
Clay City, Red River		36
Corinth, Eagle Creek, Littles Fork		250
Covington, Graham's pond		125
Lake Elbry		125
Retschulte Lake		125
Crider, Matchen Pond		100
Pyrtle Pond		100
Willow Pond		100
Crittenden, Collins's pond		125
Crofton, L. & N. Lake		275
Cumberland Falls, Cumberland River		40
Cynthiana, South Licking River		250
Danville, Adams Pond		100
Caldwell's lake		200
Caldwell's pond		100
Cecil Pond		100
Dix River		400
Dix River, Hanging Fork		500
Eastland Pond		100
Pope's pond		100
Rolling Fork Creek		200
Dexter, Clarks River		5,000
Dulaney, Scott's pond		100
Dundee, Rough River		200
Elizabethtown, Billies Creek		200
Cates's pond		200
Cedar Creek		200
Cofers Pond		200
Rhudes Creek		200
Valley Creek		200
Williams Pond		200
Wintersmith Pond		200
Elkton, Edwards's pond		200
Petrie Pond		200
Eminence, Karr's pond		60
Moody's pond		60
Railroad Pond		60
Erlanger, McClurg's pond		125
Tanner's pond		125
Utz Pond		125
Eubank, Buck Creek		40
Fishing Creek		40
Pattons Lake		40
Ewing, Brushy Fork Creek		100
Collins Pond		100
Park Lake		200
Wildcat Lake		100
Falmouth, South Licking River		250
Franklin, Aspley's pond		100
Baird's pond		100
Bunch's pond		200
Drakes Creek		360
Kentucky—Continued.		
Franklin, Drakes Creek, Middle Fork		130
Drakes Creek, Sulphur Fork		200
Duncan's pond		100
Gilbert's pond		100
Gunther's pond		130
Hobdy's pond		100
Holcomb's pond		100
Horn's pond		130
Lee's pond		100
Louis Pond		130
McClanahan's pond		200
Red Pond		130
Terrapin Creek		200
Wright's pond		130
Fredonia, Adams Pond		100
Beaver's pond		100
Brasher's pond		100
Gravoe Pond		100
Hillyard Pond		100
Hooks's pond		100
Oliver's pond (A)		100
Oliver's pond (B)		100
Ralston's pond		100
Slick Bank Pond		100
Stephenson's pond		100
Fulton, Fair Ground Pond		500
Glasgow, Beaver Creek		200
Beaver Creek, South Fork		100
Skaggs Creek		200
Wade's pond		100
Glen Dean, Hart's pond		150
Grayson, Little Sandy River		200
Greensburg, Graham's pond		100
Green River		200
Guthrie, Eagle Pond		200
Shady Pond		200
Harrodsburg, Chaplin River		200
Salt River		200
Hartford, Rough River		100
Herndon, Davidson Pond		275
Word's pond		200
Hodgenville, Isaac Essex Pond		100
Miller's pond		150
Munford Lake		100
Riggs Pond		100
South Pond		150
Hopkinsville, Johnson's pond		130
Lake Davis		275
Little River, East Fork		130
Locus Grove Pond		275
Indian Fields, Goff's pond		24
Jackson, Kentucky River, North Fork		320
Junction City, Dix River, Hanging Fork		200
Factory Pond		100
Knob Lick Creek		200
La Grange, Highland Lake		300
Pony Pond		60
Lawrenceburg, Bond's pond		100
Salt River		200
Lebanon, Bottom Pond		200
Clear Creek		200
Cloyds Creek		200
Indian Creek		200
North Fork Creek		200

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Kentucky—Continued.		
Lebanon, Salt River, Rolling Fork		500
Smith Fork Creek		200
Smith's pond		200
Stewart Creek		200
Lexington, Lake Ellerslie		124
Reservoir No. 4		125
Louisville, Harrods Creek		240
Lake Lonsdown		100
Parkview Ponds		100
Rawlin's pond		100
Salt River, Floyds Fork		180
Shadyside Lake		100
South Park Lake		2,480
Standard Club Lake		750
Young's pond		500
Loretto, Blanford's pond		200
Ludlow, Lagoon Pond		50
Lynn, Licking River		250
Madisonville, City Lake		150
Spring Lake		400
Storys Pond		100
Willow Pond		100
Morehead, Triplet Creek, East Fork		200
Morgan, South Licking River		250
Morganfield, Geigers Lake		100
Stake Lake		100
Mount Sterling, McCormick Pond		100
Muldraugh, Crystal Lake		100
Nebo, Nebo Pond		100
Newstead, Hutcherson's pond		100
Nicholasville, Cat Tail Pond		60
O. & K. Junction, Frozen Creek		80
Oil City, Beaver Creek		200
Olive Hill, Tygart River		200
Olmstead, Burchett's pond		75
Whippoorwill Creek		355
Owensboro, Panther Creek		150
Rhodes Creek		150
Round Lake		100
Whitely Lake		100
Paris, Allen's pond		100
Bell's pond		100
Brannon's pond		100
Curtis's pond		100
Davis's pond		100
Dickey's pond		100
Heller Pond		100
Higgins's pond (A)		100
Higgins's pond (B)		100
Hill's pond		100
Huston Creek		200
Mitchell's pond		100
Murphy's pond		100
O'Brien's pond		100
Overby's pond		100
Porter's pond		100
Reeves's pond		100
Snapp's pond		100
Spencer's pond		100
Stoner Creek		100
Vardon's pond		100
Watson Pond		100
Wilson Pond		100
Pewee Valley, Blue Lake		60
Pikesville, Big Sandy River		150
Pine Knot, Paunch Creek		40
Prestonsburg, Big Sandy River		100
Kentucky—Continued.		
Princeton, Conway Lake		275
Smith Lake		275
Providence, Mining Company Lake		100
Quicksand, Quicksand Creek		80
Quicksand Creek, South Fork		80
Red River, Flowers's pond		75
Rice Station, Masters's pond		20
Richmond, Phelps's pond		80
Silver Creek		40
Rockfield, McElwain's lake		130
Rock Haven, Groveland Pond		125
Rosslyn, Red River		36
Russellville, Anderson's pond		150
Edwards Pond		750
Mason's pond		750
Pulliams Pond		150
Railroad Pond		750
Walls Pond		750
Sadieville, Big Eagle Creek		375
Scottville, Hurt's pond		100
Long Creek	5,000	
Silver Creek, Broaddus's pond		40
Slaughters, Railroad Lake		260
Smiths Grove, Shobe's pond		100
Somerset, Fishing Creek		40
Stanford, Buffalo Spring Lake		80
Talmadge, Deane's pond		100
Toler, Big Sandy River, Tug Fork		125
Trenton, Waller's pond		100
Valley View, Bennet's pond		25
Vanceburg, Kinniconick Creek		300
Salt Lick Creek		100
Webster, Sinking Creek		100
Willard, Waddell's pond		100
Williamstown, Railway Reservoir		250
Winchester, Big Stoner Creek		24
Hughes Pond		75
Lulbegrud River		124
Rice's pond		12
Woodburn, Merriman's pond		130
Louisiana:		
Alexandria, Kent Pond		100
Red River		300
Arcadia, Birds's pond		200
Pecan Lake		200
Athens, Atkins's pond		100
Gandy's pond		100
Marsalis's pond		200
Baton Rouge, Lake Charles		450
Belcher, Dooley Bayou	3,000	
Blume, Howell's pond		200
Breaux Bridge, St. Clair Creek		150
Broussard, Duchamp Pond		150
Bunkie, Lake Bon Garcon	9,000	
Calhoun, Mills's pond		100
Cotton Valley, Hodges's pond		150
Derry, Acorn Lake	6,000	
Des Allemands, Bayou Des Allemands, Tributary		150
Edgerly, Wilson's pond	1,000	4,000
Elton, Canal Pond		200
Franklin, Columbia Lake	3,000	
Frierson, Frierson Pond		80
Fryburg, Lawhon Lake		150
Grand Cane, Cook Lake		150
Crystal Creek		100
Greenwood, Lake Hayes	9,000	
Homer, Edmonds's pond		150
Spring Lake		200
Iota, Andrepont Pond		150

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Louisiana—Continued.		
Keithville, Hall Lake		200
Lake Clingman		200
Lake Charles, Brick Company Pond		300
Lake Providence, Lake Providence		6,500
Laurel Hill, Belleview Pond		150
Hamilton's pond		250
Magnolia Pond		100
Spillman's pond		100
Leesville, Williams's pond	5,000	
Logansport, Caraway Lake		150
Loreauville, Fairview Ponds		150
Marthaville, Huff's pond		100
Spring Branch Pond		100
Natchitoches, Kilgore Lake		150
Opelousas, Chachere's pond		100
Durio Lake		50
Pickering, Lake Louise		465
Plain Dealing, Antrim Pond	3,000	
Shamrock, Shamrock Pond		100
Shreveport, Round Lake		300
State Line Lake		500
Urania, Mill Pond		150
Urania Lake		225
Vidalia, Cozy Corner Lake		6,000
Washburn, Lake Lena		150
Weeks, Weeks Lakes		150
Wisner, Hicks Pond		150
Maryland:		
Annapolis Junction, Little Patuxent River		400
Antietam, Antietam Creek		200
Potomac River		200
Buena Vista, Lake Royer		400
Brandywine, Rock Creek Pond		200
Cambridge, Blackwater River		200
Nanticoke River		200
Transquaking River		600
Chestertown, Ratcliff Pond		200
Cumberland, Evitts Creek		400
Potomac River		400
Potomac River, North Branch		400
Town Creek		400
Wills Creek		400
Gwynbrook, Gwynn Falls Creek		400
Hagerstown, Antietam Creek		1,400
Conococheague Creek		200
Potomac River		400
Lansdowne, Lake Rosalie		200
McPherson Station, McPherson's pond		200
Mondel, Potomac River		200
Oakland, Deep Creek		120
Patuxent, Waldman's pond		200
Selbysport, Youghiogheny River		300
Smithsburg, Raven Rock Lake		400
Tuscarora, Monocacy River		400
Woodmont, Potomac River		1,000
Massachusetts:		
Ashburnham, Naukeag Lake		80
Falmouth, Jenkins Pond		80
Pittsfield, Onata Lake		120
Pontoosuc Lake		120
Massachusetts—Continued.		
Shelburne Falls, Ashfield Pond		80
Deerfield River		40
Frankton Pond		40
Gardner Falls Reservoir		40
Griswold Pond		40
Reservoir No. 2		40
Reservoir No. 3		40
Reservoir No. 4		40
Shattuck Pond		40
Michigan:		
Wetmore, Lost Lake		300
Wiley Lake		125
Minnesota:		
Alexandria, Lake Carlos		150
Lake Cowdry		150
Lake Darling		200
Lake Geneva		200
Lake Henry		150
Lake Latoka		110
Lake Victoria		200
L'Homme Dieu Lake		50
Little Lake Darling		100
Bagley, Minnie Lake		155
Carlton, Chub Lake		195
Central Lakes, Horse Shoe Lake		100
Crosby, Serpent Lake		100
Dalton, Bock Lake		100
Duluth, Caribou Lake		75
Ellsmere, Lake Dinham		100
Erskine, Union Lake		260
Fergus Falls, Swan Lake		100
Hackensack, Stony Lake		289
Harmony, Upper Iowa River		390
Hibbing, Perch Lake		195
Highland, Long Lake		75
Homer, Mississippi River		1,061
Knife River, Ball Club Lake		75
Mic Mac Lake		75
Nigadoo Lake		75
Round Lake		75
Lanesboro, Root River		150
Mahtowa, Park Lake		155
Mankato, Lake Washington		236
Minneapolis, Lake Calhoun		130
Lake Harriet		130
Osakis, Osakis Lake		150
Park Rapids, Straight Creek		155
Straight River		350
Preston, Iowa River		200
Root River		200
Root River, North Branch		400
Root River, South Branch		200
Racine, Sleepers Pond		130
Ranier, Ranier Lake		325
Rapidan, Blue Earth River		375
Robbinsdale, Lower Twin Lake		155

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Minnesota—Continued.		
Robbinsdale, Upper Twin Lake		195
Tamarack, Turtle Lake		195
Two Harbors, Stony Lake		75
White Bear Lake, Ox Lake		130
Zumbrota, Zumbro River		550
Mississippi:		
Aberdeen, Aulruf Creek	1,500	
Athens Creek		300
Bartohatchie River		300
Bell Lake		150
Berry Creek	1,500	
Berry Pond		150
Blair Creek	1,500	
Butler Creek		300
Cipsy Creek	1,500	
Clear Creek	1,500	
Deadedie Pond		150
George Lake	1,500	
Half Moon Lake		150
Halfway Creek		300
Hatch Canal		1,000
Honey Pond		150
James Creek Lake		2,000
Jandon's pond	1,500	
Janes Pond	1,500	
Jones Creek		300
Jones Lake		100
Jones's pond		100
Kings Lake	1,500	
McKinney Creek	1,500	
Murff's pond	1,500	
Nichols Creek		200
Silver Pond		150
Smith Creek	1,500	
Smith Lake		100
Smith Pond	1,500	
South Pond		150
Star Lake		100
Stone Creek	1,500	
Walnut Lake	1,500	
Wilson Creek		150
Ackerman, Hood's pond		100
Yeager's pond		150
Amory, Gregory's pond		150
Lake Hattie		100
Malone Lake		1,150
Bay Springs, Fairview Pond		100
Blue Mountain, Johnson's pond		1,000
Booneville, Gin Branch Pond		100
Brookhaven, Beranek's pond		1,000
Hartman's pond		150
OakGrovePond		100
Pierce's lake		200
WoodlandLake		150
Byhalia, Lake Leonora		150
Neely Pond		1,000
Canton, Big Lake		1,000
Covington's lake		1,000
Lutz's pond		1,000
Russell Spalding Pond		1,000
Centerville, Raworth's pond		100
Chatawa, Tangipahoa River		1,000
Chunky, Wells's mill pond		300
Clinton, Harsh Pond		100
Primrose Pond		100
Columbia, Barnes Creek		75
Ford's lake		75
Hammond Mill Pond		75
Lampton's pond		75
Mississippi—Continued.		
Columbia, Webb's lake		75
White's mill pond		75
Columbus, Alligator Lake		200
Arnold's pond	2,500	
Lake Katherine	2,500	300
Luxapalila River	2,500	
Luxapalila River, Lower	2,500	
MiddleTombigbee River	5,000	
UpperTombigbee River	2,500	
Corinth, Crystal Lake		200
Dyer Lake		150
Meeks Lake		500
Surratt's pond		500
Crystal Springs, Ellis Lake		200
Elwood Pond		100
Dubard, Dubard's pond		100
Durant, Outlaw's pond		1,000
Edwards, Newman's pond		150
Egypt, Nelson's pond		1,500
Fayette, Cooper's pond		1,000
Fairly's lake		1,000
Flora, Farrs Pond		100
McCray's pond		1,000
Lake Wiles		100
Friars Point, Moon Lake		560
Gladys, Burn's pond		100
Gulfport, Bayou Bernard		5,000
Guntown, Norton's pond		100
Harriston, McNair Pond		100
Hattiesburg, Clark's pond		100
East Pine Lake		2,000
Lake Dreyfus		100
Hazlehurst, Barlow Lake		100
Lake Hazel		150
Lucky Lake		100
Mount Hope Lake		1,000
Heidelberg, Horse Branch Pond		2,000
Hernando, Fairfield Lake		500
Holcomb, Staten's pond		150
Iuka, Brinkley Lake		100
Jackson, Catching Lake		200
Gale Pond		100
Green's pond		1,000
McCleland's pond		500
Marson's pond		100
Spring Lake		4,000
Kosciusko, Bailey Lake		5,400
Coffey's pond		150
Fern Lake		1,000
Laurel, Log Pond		200
Valley Pond		100
Learned, Ferguson's pond		1,000
Noble's pond		100
Lexington, Hardscrabble Pond		1,000
Lorman, Shadyside Pond		1,000
Louin, Railroad Pond		1,000
Louisville, Fishing Club Lake		300
McQuien's pond		1,000
Suttle Pond		100
Willow Lake		1,000
Lyman, Railroad Pond		3,000
McComb, Sauls's pond		500
McDonald, Dearing's pond		100
McHenry, Breland's pond		2,000
Macon, Howard Lake		2,000
Martin's pond		100
Thomas's pond		2,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Mississippi—Continued.		
Macon, Thompson's pond (A)		2,000
Thompson's pond (B)		2,000
Madison, Lot Pond		100
Mill Pond		100
Magnolia, Crystal Lake		1,000
Tangipahoa River		300
Mantee, Blankenship's pond		150
Cousins's pond		150
Dexter's pond		1,000
Lanham's pond		1,000
Marshy Pond		1,000
Pate's pond		100
Reid's pond		1,000
Mathiston, Dunlap Lake		1,000
Norris Pond		1,000
Ray's pond		1,000
Mayhew, Garth's pond		150
Turner's pond		125
Meridian, Queen City Club Lake		1,500
Wanita Lake		3,000
Waterworks Ponds		3,000
Williams's pond		1,500
Mize, Ashley's pond		1,000
Moselle, Tusconola Pond		100
Natchez, Concord Pond		500
Lake Duncan		2,000
Oakland Pond		500
Saragosa Pond		2,000
Sunnyside Lake		2,000
New Albany, Bias Pond		1,000
Gaulding's pond		100
Knox Lake		150
Little Cuffy Gray Lake		150
Newton, McMullan's pond		2,000
Osyka, Heights Brook		100
Oxford, Coffee Mill Pond		200
Tarvers Lake		1,000
Pachuta, Phalti Lake		150
Parchman, Grinnell Lake		150
Pelahatchee, Pelahatchee Creek		1,000
Perkinston, Hickman's pond		150
Pheba, Live Oak Pond		100
Lone Oak Pond		100
Perkins's pond		100
Shady Nook Pond		100
Stillwater Pond		100
Philadelphia, King Pond		1,000
Peoples's pond		1,000
Richardson's pond		1,000
Plantation, Cottrell Lake		100
Pocahontas, Pocahontas Pond		1,000
Pontotoc, Highland Pond		1,000
Orchard Lake		1,000
Tunnell's pond		100
Potts Camp, Reid's pond		150
Prairie, Carlisle Pond		1,000
Prentiss, Burrow's pond		100
Ruleville, Cane Lake		200
Sardis, Orr Creek		200
Saucier, Blackledge's pond		100
Scooba, Bryan's pond		100
East Pond		100
Trammel's pond		1,500
Watts Pond		100
Shubuta, Silver Lake		100
Shuqualak, Aust Pond		2,000
Bell's lake		2,000
Clear Water Pond		200
Hairston Pond		100
Mississippi—Continued.		
Shuqualak, Jordan Lake		1,000
Land's pond		1,000
Maxey Pond		3,000
Willow Pond		2,000
Win Lake		1,000
Woodlawn Lake		2,000
Stallo, Rodger's pond		100
Starkville, Ames Pond		100
Cannon Pond		200
Clardy Pond		100
Club Pond		200
Cox Pond		150
Gay Pond		100
Harmon Lake		150
Kennard's pond		100
Mahon Lake		200
Maxwell Lake		150
Smith's pond (A)		150
Smith's pond (B)		150
Steens, Jamison's pond	2,500	
Luxapalila Creek, Upper	2,500	
Yellow Creek	2,500	
Stewart, Vernon's pond		1,000
Terry, Jones Lake		200
Tibbee, Walker's pond		3,000
Tomnolon, Woods Pond		100
Tupelo, Ballardsville Pond		1,000
Boughfalah Park Lake		500
Center Ridge Lake		500
Duncan Pond		500
Green's lake		100
Thompson's pond		200
Union, Blue Pond		2,000
Gardner's pond		100
Hester's pond		150
Ross Pond		150
Vicksburg, Beech Pond		2,000
Lanier Lake		500
Powers Lake		2,000
Wahalak, Edmonds's pond (A)		1,500
Edmonds's pond (B)		1,500
Lake McKee		1,500
Persons's pond		1,500
Wards Lake		3,000
Water Valley, Copeland Lake		1,000
Otuclofa Lake		1,500
Waynesboro, Baygents Pond		100
West Point, Howard's pond		100
Springside Pond		3,000
Wheelers, Cox's pond		150
Wiggins, Breland's pond		150
Woodville, Casey's lake		175
Hart's pond		150
Lake Clement		100
Missouri:		
Aurora, Crane Creek		300
Dillard's pond		100
Flat Creek		300
Honey Creek		300
Spring River		300
Ava, Hunter Creek		270
Lake Crystal		180
Cedar Gap, Cedar Gap Lake		180
Clinton, Fish Lake		1,000
Deepwater, Dickey Lake		200
Everton, Poindexter's pond		500
Exeter, Shoal Creek		200
Ferguson, Club Lake		4,000
Granby, Shoal Creek		300
Grandview, Cottingham Lake		200
Shady Slope Pond		100

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Missouri—Continued.		
Harrisonville, Lake Luna		400
Independence, Christopher's pond		100
Compton's pond		100
Dickinson's lake		200
Joplin, Sloan's lake		300
Walnut Ridge Pond		200
Lamar, Muddy Creek		400
Spring River, North Fork		400
Lebanon, Malone's pond		100
Liberty, Interurban Lake		500
Marceline, Prairie Lake		100
Mokane, Railroad Lake		400
Montier, Current River, Jacks Fork		300
Mount Vernon, Cherry Springs Creek		100
Stahls Creek		200
Neosho, Montgomery Lake		300
Noel, Elk River		800
Oasis, Fish Lake		500
Osceola, Spring Lake		200
Pleasant Hill, Lake Leonard		600
Richland, Gasconade River		200
Ritchy, Shoal Creek		200
Rolla, Big Beaver Creek		200
Little Piney River		300
North Spring Creek		200
Upper Bourbois River		300
Salem, Spring Creek		200
Seneca, Big Lost Creek		200
Sycamore Creek		200
Springfield, Lake Reflection		200
Versuilles, Big Gravois Creek		60
Cold Bank Creek		60
Flat Creek		60
Indian Creek		60
Little Gravois Creek		60
Little Haw Creek		60
Locust Creek		60
Moreau Creek		60
Warsaw, Hogles Creek		90
Webb City, Centor Creek		400
Wesco, Meramac River		400
Windsor, Rock Island Lake		600
Wilkerson Park Pond		500
Montana:		
Eureka, Eureka River		75
Nebraska:		
Belvidere, Lahners's pond		30
Genoa, Dower Canal Pond		30
Madison, Lake Henry		90
New Hampshire:		
Keene, Chesterfield Lake		160
New Jersey.		
Beaver Lake, Beaver Lake		300
Boonton, Split Rock Lake		500
Branchville, Culver Lake		300
Bridgeton, Crystal Lake		300
Tumbling Dam Lake		500
Bridgeville, Mountain Lake		300
Clayton, Fries Mill Pond		200
Collingswood, Newton Lake		200
Gibbstown, White Sluice Pond		400
Gloucester, Malaga Lake		200
New Jersey—Continued.		
Gloucester, Portstown Lake		300
Hackensack, Hackensack River		300
State fish commission		400
Hewitt, Greenwood Lake		300
Hopatcong, Lake Hopatcong		1,225
Mays Landing, Leneape Lake		500
Morris Plains, Hensler's pond		100
Jaqui's pond		200
Mountainview, Pompton River		200
Newark, Weequahic Lake		500
Newfoundland, Cedar Pond		300
Orange, Cable Road Lake		300
Paterson, Greenwood Lake		400
Pedricktown, Fernny Run		150
Willow Grove Lake		300
Pompton Lake, Pompton Lakes		500
Princeton Junction, Carnegie Lake		800
Ramsey, Freemans Lake		200
South Amboy, Kuhns Pond		150
South Dennis, Beaver Pond		200
South Plainfield, Seidler's pond		150
Sterling Forest, Greenwood Lake		400
Summit, Feltville Lake		500
Passaic River, Upper		250
Swartswood, Swartswood Lake		500
Vineland, Willow Grove Pond		200
Westmont, Crystal Lake		200
Woodcliff Lake, Hackensack River		300
New Mexico:		
Alamogordo, Morgan's pond		35
Albuquerque, Gutierrez Lake		60
Hubbell Lake		105
Artesia, Lake Elena		200
Aztec, San Juan River		16
Carlsbad, Pecos River		300
Rocky Arroya Creek		100
Cimarron, W. S. Lake		200
Clayton, El Rito Lake		35
Corona, Corona Pond		70
Coyote, Coyote Pond		70
Deming, Landauer's pond		130
Dulce, Dulce Lake		16
Gallup, Mariono Lake		300
Hagerman, Felix Creek		100
Las Vegas, Deep Lake		60
South Pond		150
Luna, Luna Pond		70
Roswell, Club Lake		200
Dimmitt Lake		100
Haymaker's pond		100
Lea Lake		100
North Lake		100
North Spring River		100
Rainbow Lake		100
South Spring River		200
Sutherland Lake		100
Santa Fe, Rio Grande		200
Santa Rosa, Agua Negra Lake		105
Black Lake		35
Escondido Lake		35
Goose Lake		35
West Baca Lake		35

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
New Mexico—Continued.		
Silver City, Peter Megan Lake		100
Taiban, Willow Pond		100
Tucumcari, Pajorita Canadian Pond		70
New York:		
Albany, Appledale Lake		120
Altamont, Norman Kill River		100
Binghampton, Chenango River		60
Cutlers Lake		60
Susquehanna River		100
Corning, Cohocton River		90
Davenport Center, Sexsmith Lake		120
Fallsburgh, Kiamesha Lake		150
Feura Bush, Lawson Lake		60
Fishkill, Brinckerhoif Pond		50
Gay Head Pond		50
Hamburg, Luck's pond		50
Mendon, Mendon Ponds		100
Newburg, Orange Lake		300
Owego, Susquehanna River		90
Paul Smiths, Osgood Lake		250
Port Jervis, Bauer Lake		60
Red Creek, Red Lake		250
Riverside, Brant Lake		90
Schroon Lake		90
Slingerlands, Tower Farm Pond		90
Troy, Hudson River		120
Tully, Tully Lake		200
Walden, Wallkill River		250
West Rush, Honeoye Creek		50
North Carolina:		
Advance, Pack's pond		4
Ashboro, Beattie McGee Creek		750
Asheville, Gatlin Lake		75
Battleboro, Davis Pond	1,000	
Black Mountain, Swannanoa River		4
Bladenboro, Bridger's pond		4
Cameron, Kelly's pond		25
Charlotte, Catawba River		20
Clinton, Canady's pond	500	
Coats, McCuller Pond		1,000
Corinth, Cape Fear River		1,800
Cumnock, Egypt Pond		4
Dunn, Barnes's pond		500
Honeycut Pond		1,000
Rhodes Pond		3,020
Starling Pond		1,000
Edgemont, Wilson Creek		125
Elizabethtown, White Lake		2,000
Elkins, Spicer's pond		8
Elk Park, Watauga River		400
Enfield, Moss's pond	1,000	
Woodlawn Pond	1,000	
Faison, Aman's pond		4
Panther Creek Park Pond		8
Six Runs	2,000	
Fayetteville, McNeill's pond		1,000
Four Oaks, Brown's pond		1,500
Lassiter's pond		750
Fuquay Springs, Nills Creek Pond		500
Greensboro, Bowman Pond		1,500
Burton's pond		750
Cobb's pond		250
Euliss Creek Pond		750
Jennie Creek		500
Nix Pond		200
North Carolina—Continued.		
Greensboro, Philadelphia Lake		750
Print Works Lake		500
Henderson, Sutherland's pond		1,500
Hickory, Catawba River		4,550
High Point, Marsh Lake		1,500
Yadkin River		500
Hillsboro, Eno River		5,200
Seven Mile Creek		750
Kannapolis, Cannon Lake		500
Kernersville, Abbotts Creek		4
Keyser, Campbell's mill pond		500
Kings Mountain, Anna Pond		50
La Grange, Mill Pond		700
Lake Junaluska, Lake Junaluska		75
Lake Toxaway, Lake Toxaway		24
Madison, Hogans Creek		200
Magnolia, Rackley's pond	500	
Maxton, Lumber River		1,500
Shoe Heel Creek		1,000
Mayesworth, Duharts Creek		8,000
Mebane, Murray Hill Lake		150
Vincent Mill Pond		100
Mocksville, Dutchman Creek Pond		4
Monroe, Braswell's pond		600
Cedar Lake		300
Funderburk's pond		450
Krauswood Waves Pond		300
Lee Park Bake		500
Maness Pond		300
Purserview Pond		500
Sams Pond		700
Shutes Pond		700
Morrisville, Sorrell's pond		700
Mount Airy, Leveling Creek		750
Mount Olive, Williams's mill pond	1,500	
Mount Tabor, Iron Hill Pond		400
New Bern, Brice Creek	1,000	
Haywood Creek	2,000	
Trent River	5,000	2,000
Wilson Creek	2,000	
N. Wilkesboro, Beaver Creek		8
Cub Creek		8
Elk Creek		8
Mill Creek		12
Reddies River		12
Overhills, Overhills Lake		20
Polloksville, Trent River		1,000
Poston, Johnson's pond		300
Raeford, McFadgen's pond		1,000
McLauchlin's pond		500
Maplehurst Lake		500
Moore's pond		1,000
Rockfish Creek		1,000
Raleigh, Beaver Dam Club Pond		1,000
Country Club Lake	1,000	
Lakewood Pond		2,000
Milburn Club Pond		1,000
Panther Branch Pond		1,000
Parker Thompson Pond		1,000
Spring Lake	500	
Yates Pond		104
Red Spring, Antioch Pond		1,000
Rockford, Haw Creek Pond		8
Rockingham, Marks Creek Pond		700
Spring Pond		500
Wall's pond		500
Roseboro, Little Coharie Creek		8

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
North Carolina—Continued.		
Roseboro, Wildcat Pond		12
Gregory's pond		1,000
St. Paul, Great Marsh Pond		2,000
Sanford, Buffalo Pond		500
Seymour's pond		500
Wicker Rock Pond		500
Scotland Neck, Hall Pond		12
Webb Pond		16
Siloam, Skin Cabin Creek		8
Skyland, Doe's pond		50
Statesville, Brushy Creek		500
Fourth Creek		1,200
Hunting Creek		1,200
Jennings Pond		200
Little Rocky Creek		750
Rocky Creek		2,450
Steele Pond		500
Swans Station, Morris Lake		8
Teacheys, Badger Pond		4
Wilmington, Greenfield Lake		12
Youngsville, Moores Mill Pond	2,000	
North Dakota:		
Addison, Maple River		200
Bottineau, Lake Metegoshe		400
Cayuga, Lake Tewauken		200
Crary, Wood Lake		100
Crystal Springs, Crystal Springs Lake		200
Dawson, Lake Isabel		200
Devils Lake, Devils Lake		550
Freshwater Lake		300
Dogden, Cottonwood Lake		100
Dunseith, Lake Horse Shoe		100
Fullerton, Artesian Pond		100
Hankinson, Lake Elsie		200
Lidgerwood, Edd Lake		200
Lisbon, Cottonwood Lake		200
Mott, Cannon Ball River		100
New Salem, Egli's pond		100
Petrel, Lemmon Public Reservoir		500
Powers Lake, Powers Lake		100
Ray, Beaver Creek		200
Ruso, Strawberry Lake		300
Rutland, Buffalo Lake		200
Printervill's pond		100
St. John, Allens Lake		200
Bluebill Lake		100
Bonwin Lake		100
Brush Lake		100
Cameron Lake		150
Edgewood Lake		100
Fish Lake		150
Garber Lake		150
Horse Shoe Lake		100
Kane Lake		150
Lake Upsilon		100
Long Lake		100
Lynch Lake		150
Mill Lake		150
Valley City, Sheyenne River		200
Walcott, Sheyenne River		200
Warwick, North Washington Lake		200
Washburn, Painted Woods Lake		200
Ohio:		
Alexandria, Raccoon Creek		120
Watkins Pond		40
Alliance, West Park Lake		100
Antwerp, Maumee River		150
Aurora, Centreville Pond		200
Batavia, Little Miami River, East Fork		24
Ohio—Continued.		
Bellaire, Captina Creek		100
Berea, Stearn's pond		40
Bridgeport, Wheeling Creek		100
Bucyrus, Little Scioto River		80
Cadiz, Stillwater River, forks of		100
Cambridge, Mining Company Pond		100
Near Cut Lake		100
Canfield, Mahoning Lake		200
Cincinnati, Lake Seewald		24
Oakhurst Pond		25
Cleveland, Brookside Lake		40
Evergreen Lake		40
Rockefeller Lake		80
Columbus, Big Walnut Creek		48
Esswein Lake		12
Little Darby Creek		24
Little Walnut Creek		24
Congress Lake, Congress Lake		80
Coshocton, Canal Basin Lake		200
Killbuck Creek		100
Muskingum River		100
Tuscarawas River		100
Walhonding River		100
Wills Creek		100
Covington, Greenville Creek		200
Stillwater River		200
Delhi, Mill Pond		60
Murphy's pond		25
Derwent, Beach Pond		100
Fernwood, Cross Creek		200
Fremont, Sandusky River		200
Geauga Lake, Geauga Lake		200
Greendale, Greendale Lake		80
Greenfield, Paint Creek		75
Hamilton, Lakeview Pond		300
Harpster, Harpster Lake		40
Harrison, Whitewater Creek		50
Hebron, Buckeye Lake		80
Lake View, Indian Lake		400
Leetonia, Cherry Valley Pond		200
Lima, Griffith Pond		100
McCullough Lake		100
Mirror Lake		100
Lockville, Sycamore Creek		40
London, Deer Creek		120
Loveland, Little Miami River		50
Malvern, Sandy Creek		160
Mansfield, Clear Fork River		80
Clear Fork River, North Branch		80
Clear Fork River, South Branch		80
Dickson Creek		40
Mohican River, Rocky Fork		80
Minster, Loramie River		100
Montezuma, Lake Mercer		200
Moran, Round Pond		40
Mount Blanchard, Blanchard River		200
Mount Sterling, Deer Creek		48
Mount Vernon, Kokosing River		200
Napoleon, Maumee River		150
Nevada, Broken Sword Creek		80
Oakwood, Auglaize River		100
Oneida, Big Sand Creek		200
Pleasant Hill, Stillwater River		200
Portsmouth, Brush Creek		24
Little Scioto River		12

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Ohio—Continued.		
Portsmouth, Pine Creek		12
Sunfish Creek		24
Prospect, Scioto River		40
Ravenna, Brady Lake		400
Ripley, Eagle Creek		120
St. Marys, Lake St. Marys		200
Sardina, Weisbrodt's pond		12
Scio, Alder Lick Creek		100
Connotton Creek		100
McGuire Creek		100
Stillwater Creek		100
Sherwood, Maumee River		100
Sycamore, Sandusky River		100
Tiffin, Lake Mohawk		200
Little Sandusky River		200
Troy, Miami River		150
Uniopolis, Maple Lake		100
Upper Sandusky, Broken Sword Pond		40
Sandusky River		80
Tymocktee Creek		80
Washington C. H., Bridge Run		12
Compton Creek		12
Gault's pond		12
Indian Camp Run		12
Paint Creek		24
Rattlesnake Creek		24
Sugar Creek		24
West Milton, Stillwater River		250
Woodstock, Brush Lake		100
Zanesville, Muskingum River		200
Oklahoma:		
Ada, City Reservoir		300
Clear Boggy Creek		300
Antlers, Harkey's pond		100
Ardmore, Ardmore Club Lake		200
Caddo Lake		200
Chickasaw Lake		200
City Lake		200
Kinkade's lake		100
Lake Meda		100
Lake Sheridan		100
Loyd's pond		125
Maxwell's pond		100
Rickey Lake		200
Stuart's lake		100
Atoka, Patapa Creek		200
Smiser's pond		100
Bessie, Jelenick's pond		100
Binger, Spring Lake		100
Bokoshe, Deer Lake		200
Brinkman, Quality Square Lake		100
Broken Arrow, Hannifin's pond		50
Haskell State School Lake		50
Calvin, Flinchum's pond		100
Cherokee, Brewster's pond		100
Chilocco, Chilocco Lake		150
Clarita, Elm Creek		150
Lake Noonan		150
Coalgate, Wood Lake		100
Oklahoma—Continued.		
Comanche, Florence's pond		50
Cordell, Boggy Creek		200
Boggy Creek, branch of		100
Elk Creek		200
Custer City, Lung's pond		100
Dawson, Berryman's pond		100
Duncan, Jorgenson's pond		50
Wagon Road Pond		50
Durant, McDonald's pond		100
Powell Lake		100
Utterback's pond		100
Williams Lake		100
Wood Lake		100
Eldorado, Carmel Lake		100
Elk City, Beck's pond		100
King's pond		100
Read's pond		100
El Reno, Blue Lake		30
Ellison Lake		120
El Reno Club Lake		200
Wood Lake		30
Enid, Helberg Lake		30
Kendall's lake		120
Erick, Deer Creek		100
Flanagan's pond		100
Haddock's pond		100
Fargo, Eight Mile Creek		100
Fletcher, Henkel Lake		100
Frederick, Prairie Spring Lake		100
Wearmouth's pond		100
Gore, Illinois River		100
Grandfield, Harris's pond		100
Hetzel Lake		200
Lake Willow		100
Granite, Armstrong's pond		100
Grove, Cow Skin River		150
Guthrie, Deep Water Lake		100
Oak Grove Lake		100
Willow Springs Lake		100
Heavener, Black Fork River		300
Poteau River		300
Hobart, Gearhart's pond		100
Holdenville, Hardwick's pond		100
Hollis, Motley's lake		100
Sandy Creek		200
Spring Lake		200
Weatherby's pond		100
Jett, Big Horn Pond		100
Jones, Jones Lake		200
Kellyville, Half Section Pond		100
Kenefic, Johnson Lake		100
Kiowa, Cates's pond		100
Hall's pond		100
Katy Lake		100
Kountry Klub Lake		300
Lankford's pond		100
North Boggy Creek		100
Yarbrough's pond		100
Konawa, Bates's pond		100
Krebs, Mountain Gap Lake		200
Lawrence, Kice Lake		200
Lawton, Chandler Creek		200
Lake Gondola		100
Lake Law-ton-ka		350
Lebrecht's pond		100
Little Medicine Creek		150
Rose Hill Lake		100
Leedey, Kent's lake		100
Lenapah, Etchen Lake		100
Loveland, Pearson's lake		100
McAlester, Talawanda Lakes		300
Madill, City Lake		300
Mangum, Cheek's pond		100

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Oklahoma—Continued.		
Mangum, Reaves's pond		100
Sulphur Creek		130
Manitou, Thacker Springs Pond		200
Maremec, Burton's pond		100
Marietta, Anglin Lake		100
Brookshire Creek		100
Chegan Creek		100
Cochran Creek		100
Culwell Lake		100
Fricke's pond		100
Graham Lake		100
Hovencamp Lake		200
Love Lake		100
Marietta Lake		300
Oil Creek		100
Renfro's lake		100
Rock Creek		100
Washington Lake		200
Medford, Goldy Lake		30
Wakita Lake		120
Melburn, Kelly's pond		100
Mill Creek, Blue River		100
Mooreland, Crystal Lake		25
Lambert's pond		25
Willow Springs Lake		25
Mounds, Dose's pond		100
Mountain View, Beaver Creek		60
Cedar Creek		100
Cottonwood Creek		60
East Buffalo Creek		200
Felkner Creek		200
Jones Lake		100
Leonard Lake		200
Pecan Creek		60
Pewthers Lake		100
Rainy Mountain Creek		200
Stinking Creek		200
Sugar Creek		200
Vankirk Lake		60
Muskogee, Club Lake		100
Illinois River		250
Illinois River, Barren Fork		200
Nash, Bowls's pond		100
Wagon Creek		200
Newkirk, Santa Fe Lake		150
Norman, Ambrister's lake		100
Central Lake		100
Oakwood, Cottonwood Lake		100
Okemah, Pettit's pond		50
Oklahoma City, Belle Isle Lake		150
Blue Lake		100
Earp's lake		50
Granite Lake		50
Kelly's pond		50
North East Lake		300
Oakwood Lake		50
Okmulgee, Roberts's pond		100
Pauls Valley, Martin's pond		100
Safety Pond		100
Thompson Lake		300
Oklahoma—Continued.		
Pawhuska, Bird Creek		200
Clear Creek		150
Clear Creek Reservoir		100
Perry, Perry Reservoir		100
Rice's pond		50
Ponca City, Bodoc Creek		100
Bois d' Arc Creek		100
Coon Creek		100
Swaley Pond		50
Turkey Creek		100
Wild Horse Creek		120
Quinlan, Cedar Lane Pond		25
Ralston, Chase's pond		50
Ravia, Brown Lake		100
Sallisaw, Sallisaw River		400
Sapulpa, Euchre Lake		200
Pretty Water Creek		100
Sapulpa Pond		200
Savanna, Crosby Lake		100
Schulter, Holleyman's pond		200
Seminole, Roscoe Lake		100
Sharon, Dunston's pond		100
Lake Clyde		100
Persimmon Creek		100
Phillips's pond		100
Sand Creek		100
Sand Creek Pond		100
South Persimmon Creek		100
Shawnee, Baldwin Lake		50
Shattuck, Ivanhoe Creek		100
Pony Creek		100
Rock Creek		100
Rock Springs Pond		100
Star Valley Pond		200
Snyder, Huston's pond		100
Mountain Slope Pond		200
Willow Pond		100
Wright's pond		100
Sparks, Olympia Lake		50
Spiro, Water Works Lake		300
Stonewall, Canyon Creek		100
Lake Philips		100
Sheep Creek		100
Southside Lake		100
Strong City, Ratliff Lake		100
Supply, Irwin Lake		100
Talihina, Wilson's pond		300
Tangier, Horse Shoe Lake		200
Texola, Blair's pond		100
Howard's pond		200
Whorton Lake		100
Tulsa, Park Lake		200
Sigler's pond		100
Tuttle, Waldon Lake		200
Vici, Innis Lake		100
Pearl Lake		100
Vinita, Elm Branch		100
Locust Creek		100
Sweet Water Pond		100
Wagoner, Harrill Lake		100
Jones's lake		50
Thompson Lake		150
Wainwright, City Lake		200
Wann, M. K. & T. Pond		150
Wardville, Farris's pond		100
Watauga, McBride's pond		100
Watova, Young's pond		50
Waukomis, Baker's pond		30
Waurika, Beaver Creek		200
Lake Stewart		100
Wayne, Willow Pond		100
Wewoka, Johnson's pond		100
Little River		200

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Oklahoma—Continued.		
Weewoka, North Canadian River		200
Wewoka Creek		100
Woodward, Bass Lake		25
Bowlby Lake		25
Bud Creek Lake		60
Crystal Springs Lake		25
Double Loop Lake		100
Greer Lake		25
Hastings Lake		25
Healy Lake		60
Indian Springs Lake		25
Morrow Lake		120
Peugh Lake		50
Pine Branch Pond		60
Pleasant Valley Lake		100
Russau Lake		100
Sand Creek		100
Sand Creek, Headwaters		25
Sand Ponds		100
Santa Fe Lake		200
Spring Lake		60
Swarts Lake		100
Trego Lake		100
Walnut Lake		60
Woodward Creek		100
Wyatt and Ferguson Lake		100
Wyandotte, Lost Creek		300
Pennsylvania:		
Akron, Cocalico Creek		200
Allentown, Saucer Creek Pond		250
Altoona, Lake Altoona		300
Annville, Swatara Creek		225
Aughwick, Aughwick Creek		300
Beech Creek, Bald Eagle Creek		600
Beech Creek		300
Bethayres, Mohawk Pond		125
Birdell, Birdell Creek		200
Blandon, Maiden Creek		500
Blue Stone, Pine Creek		300
Boiling Springs, Ahl's pond		200
Yellow Breeches Creek		400
Bryn Mawr, Lake Tharon		250
Cambridge Springs, Conneautee Creek		60
Cambridge Springs, Edinboro Lake		60
Cammal, Pine Creek		200
Carlisle, Conodogwinet Creek		400
Mount Holly Lake		400
Cedar Knoll, Cedar Knoll Pond		200
Hibernia Pond		200
Chadds Ford, McCune's pond		125
Chambersburg, Conococheague Creek		200
Denver, Cocalico Creek		200
Garretts Dam		200
Leeds Creek		125
Shimps Pond		200
Swamp Creek		125
Eagles Mere, Eagles Mere Lake		300
East Greenville, Lily Lake		125
Emigsville, Big Conewago Creek		200
Pennsylvania—Continued.		
Emigsville, Little Conewago Creek		200
Ephrata, Cocalico Creek		200
Hammer Creek		200
Middle Creek		200
Muddy Creek		200
Essick Station, Highland Lake		300
Fairfield, Widewater Pond		60
Flinton, Beaver Dam Run		50
Franklin, French Creek		300
Gettysburg, Marsh Creek		400
Glen Loch, Valley Creek		250
Goldsboro, Susquehanna River		400
Gouldsboro, West End Pond		100
Greason, Conodoguinett Creek		200
Great Bend, Quaker Lake		150
Silver Lake		100
Greensburg, Bush's pond		150
Hanover, Conewago Creek		200
Conewago Creek, South Branch		200
Honesdale, Kellows Pond		120
Hosensack, Hosensack Creek		250
Walters Creek		250
Huntingdon, Juniata River		300
Juniata River, Raystown Branch		300
Standing Stobe Creek		200
Stone Creek		200
Icedale, Brandywine Creek		200
Jenkintown, Pennypack Pond		125
Jersey Shore, Pine Creek		500
Jonestown, Little Swatara Creek		300
Swatara Creek		225
Lake Carey, Lake Carey		150
Lancaster, Cocalico Creek		250
Conestoga River		1,500
Pequea Creek		250
Lebanon, Stovers Pond		150
Stracks Pond		150
Lenhartsville, Maiden Creek		250
Lewisburg, Beaver Run		25
Buffalo Creek		50
Chillisquaque Creek		50
Spruce Run		25
Turtle Creek		25
Lititz, Cocalico Creek		250
Middle Creek		200
Manheim, Chicques Salunga Creek		200
Mapleton, Jackstown Pond		150
Juniata River		200
Mercer, Otter Creek		50
Mercersburg, Conococheague Creek		400
Licking Creek		400
Minersville, Crystal Pond		50
Long Pond		50
Silverton Ponds		150
Morganza, Morganza Pond		150
Mount Wolf, Big Conewago Creek		800
Muncy, Muncy Creek		50
Susquehanna River		50
New Oxford, Little Conewago Creek		400
New Ringgold, Rauschs Pond		50
Oil City, Sugar Lake		300

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Pennsylvania—Continued.		
Orwigsburg, Hummel's pond		50
Millers Pond		50
Moyers Pond		300
Oxford, Octoraro Creek		250
Parkesburg, Glenville Pond		500
Peach Bottom, Susquehanna River		250
Pequea, Pequea Creek		250
Susquehanna River		500
Phoenixville, French Creek		250
Perkiomen Creek		250
Reading, Maiden Creek		150
Manatawny Creek		150
Ontelaunee Creek		250
Schuylkill River and tributaries		900
Willow Creek		50
Wyomissing Creek		50
Wyomissing Creek, branch of		150
Reese, Juniata River		300
Rockmere, Allegheny River		50
Rohrerstown, Little Conestoga Creek		250
Royersford, Mill Pond		250
Perkiomen Creek		250
Schuylkill River		250
Swamp Creek		250
Sabula, Sabula Lake		50
Scotland, Conococheague Creek		200
Seward, Big Spring Pond		150
Slate Run, Pine Creek		300
Smock, Rainey Lake		50
Spring City, French Creek		250
Kimberton Pond		125
Mill Pond		250
Stoyestown, Quemahoning Lake		300
Tionesta, Allegheny River		300
Tower City, Wiconisco Creek		180
Uniontown, Fans Run		50
Wagontown, Wagontown Pond		150
Waterville, Big Pine Creek		550
Little Pine Creek		25
Westtown, Westtown Lake		250
Williamsport, Little Bear Creek		300
Loyalsock Creek		300
Susquehanna River, West Branch		240
Wind Ridge, South Wheeling Creek		24
Woodbine, Grove's pond		400
Wrightsville, Bennetts Creek		200
Bermudian Creek		200
Cabin Creek		200
Cadorus Creek		200
Fishing Creek		200
Kreidlers Creek		200
Otter Creek		200
Susquehanna River		200
Yardley, Lake Afton		125
Porto Rico:		
Guayama, Carite Reservoir		600
South Carolina:		
Abbeville, Little River		300
Allen, Smith's mill pond		200
Bayboro, Mishoe's pond		200
South Carolina—Continued.		
Belton, Neals Creek, headwaters		12
Camden, Denkins Mill Pond		50
Holly Hedge Pond		300
Little Pine Lake		24
Chesterfield, Spring Creek		12
Columbia, Cobb's pond		400
Lyles Pond		50
Messers Mill Pond		50
Conway, Johnson's pond		100
Coronaca, Saluda River		48
Easley, Black Pond		200
Blue Water Pond		200
Clear Water Pond		200
Mountain Pond		200
Piedmont Pond		200
Saluda Pond (A)		200
Saluda Pond (B)		200
Upland Pond		200
Edgemoor, Fishing Creek		25
Ehrhardt, Clear Water Lake		50
Engleside, Engleside Lake		200
Florence, Black Creek		1,000
Fort Lawn, Fishing Creek		50
Great Falls, Catawba River Pond		100
Greenville, Garlington's pond		200
Piney Mountain Lake		48
Greer, Beaver Dam Pond		200
Prospect Mills Pond		800
Hampton, Clifton Mill Pond		500
Hartsville, Black Creek Pond		300
Hartsville Lake		500
Ox Pen Pond		400
Holly Hill, Alligator Lake		50
Little Pedee Lake		50
Pedee Creek		100
Honea Path, Arnold Creek		12
Estes's pond		12
Gaupp Creek		12
Line Creek		12
McCuen Creek		12
Williams's pond		100
Leesville, Hare's pond		50
Lexington, George's pond		50
Lowrys, Turkey Creek		24
Mayesville, Scapeoer Pond		250
Middendorf, Johnson's pond		600
Mullins, Lake Swamp Creek		500
Little Pedee River		700
Lumber River		700
Smith's mill pond		600
Norris, Twelve Mile Creek		500
Pelzer, Hindman's pond		12
Pomaria, Cannon Creek Lake		48
Rock Hill, Power Company Pond		74
Ruby, Little Black Creek		12
St. Matthews, Wannamaker's pond		100
Spartanburg, Arcadia Mill Pond		1,600
Summerville, Schultz Lake		100
Sumter, Cherry Vale Pond		50
Hoyts Pond		50
McCutcheon Pond		200
Taylors, Chick Springs Lake		12
Wagener, Giddy Swamp Pond		25
Kennedy's pond		50
Wellford, Middle Tyger River		500
South Tyger River		524
Westminster, Canels Fork Creek		24
Chauga Creek		24

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
South Carolina—Continued.		
Westminster, Cheestoee Creek		24
Ramsey Creek		24
Toxaway Creek		24
Weston, Clarkson's pond		50
Williamston, Saluda River		550
South Dakota:		
Big Stone City, Big Stone Lake		200
Blunt, Farmers Lake		400
Bowdle, Odessa Lake		100
Brookings, Oakwood Lake		400
Bruce, Tetonkaha Lake		300
Burke, Murphy Creek		30
Ponco Creek		90
Canning, Peterson's pond		100
Chamberlain, Cecelian Lake		200
Clark, Barley Lake		200
Clear Lake, Clear Lake		600
Colome, Willow Creek Pond		30
Dallas, Ponco Creek		30
Faith, Brushy Creek		400
Red Scaffold Creek		200
Sweet's pond		200
Gregory, Gibson's pond		30
Humboldt, Beaver Lake		279
Langford, Clear Lake		200
Roy Lake		200
Six Mile Lake		200
Lantry, Big Bear Creek		300
Lemmon, Lee's pond		100
Madison, Lake Madison		279
Midland, Cottonwood Pond		100
Murdo, Township Pond		200
Oelrichs, Strouse's lake		200
Pierre, Brown's pond		100
Lake Medoka		155
Rockham, Grabinski's pond		200
St. Charles, Burnt Rock Creek		30
Thoene's pond		30
Sisseton, Aspen Lake		100
East Clear Lake		100
Pickerel Lake		100
South Dry Wood Lake		150
Traverse Lake		150
White Stone Lake		100
Wolph Lake		100
Tatanka, Lake Tatanka		200
Timber Lake, Spring Lake		100
Toronta, Fish Lake		300
Valentin^, Roubideaux Pond		30
Watauga, Pleasantdale Lake		100
Watertown, Lake Kampeska		400
Webster, Pickerel Lake		150
Willow Lake, Willow Lake		300
Winner, Gesing's pond		60
Government Dam		60
Witten Lake		30
Tennessee:		
Adams, Sory's pond		15
Ashland City, Big Marrowbone Creek	2,500	
Jenkins pond	2,500	
Sycamore Creek	7,500	1,000
Brighton, Sunnyside Lake		1,000
Bristol, City Lake		100
Brownsville, Kinney's lake		500
Butler, Elk River		200
Carter, Stony Creek		200
Cedar Hill, Bally's pond		15
Long's lake		30
Red River, Sulphur Fork		30
Chapel Hill, Spring Creek		1,000
Tennessee—Continued.		
Chattanooga, Bonny Oaks Pond		20
Hixon Pond		20
Lookout Creek		40
McCallie Lake		20
Mountain Creek		20
Norris's pond		40
Reads Lake		20
Clarksville, Anderson's pond	5,000	
Big West Fork Pond	5,000	
Hansbough Mill Pond	2,500	
Harper Pond	2,500	
Liggon Pond	2,500	
Red River, Little West Fork	5,000	
Red River, South Fork		150
Spring Creek	5,000	1,000
Warfield Lake	2,500	
West Fork Creek	5,000	
Cleveland, Baker Creek		40
Candies Creek		80
Lake Wildwood		80
Rainbow Lake		40
Spring Water Lake		40
Clutesville, Duck River		600
Coal Creek, Coal Creek		150
Lovly's lake		75
Columbia, Smith's pond		15
Donelson, Whitworth's pond		1,000
Elizabethton, Watauga River		200
Estill Springs, Modena Lake		150
Fayetteville, Cunningham's pond		15
Franklin, Jordan's lake		15
Gallatin, Turner's lake	5,000	
Gray Station, Ford Creek		200
Greenwood, Spring Creek		1,000
Guthrie, Sunny Lake		15
Harriman, Emery River		300
Heiskell, Smith's mill pond		100
High Cliff, Clear Fork River		250
Holton, Hickory Creek		250
Huntland, Beans Creek		30
Indian Springs, Hays Pond		200
Iron Hill, Iron Hill Pond	1,000	
Jackson, Highland Park Lake		1,000
Jellico, Elk Fork Creek		250
Johnson City, Watauga River		200
Kingston Springs, Harpeth River	3,000	
La Vergne, Goodwin's pond		200
Lebanon, Louise Pond	1,000	
McDonald Pond	2,000	
Lewisburg, Duck River		45
Limestone, Big Limestone Creek		200
Jockey Creek		100
Lynville, Rippey's pond		15
McKenzie, Clear Creek Lake		2,000
Maxwell, Silver Lake		15
Milligan College, Buffalo Creek		200
Monterey, Hemlock Lake		15
Morrison, Ramsey's pond		15
Mountain City, Big Spring Pond		100
Laurel Creek		100
Murfreesboro, Brother's pond		15
Caney Fork Creek, West Fork		90

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Tennessee—Continued.		
Murfreesboro, Downing's pond		15
Nashville, Lake Davidson		1,009
Richland Creek		150
Newport, Boyer's pond		100
Two Spring Pond		100
Oakdale, Emory River		300
Oneida, Lower Pine Creek		150
Orlinda, Berry's pond		130
Parrottsville, Meyers's pond		100
Pegram Station, Hutton Pond		1,000
Peytona, Peytona Farm Pond	2,500	
Pierce Station, Winston Pond		500
Pikeville, Caine Creek		150
Sequachie River		270
Portland, Mink's pond		130
Roan Mountain, Doe River	300	
Shell Creek	150	
Wilson Creek	150	
Rockwood, Whites Creek		60
Roddy, Whites Creek		60
St. Bethlehem, Bourne's pond	2,500	
Dudley Pond	2,500	
Red River, Little West Fork	5,000	
Spring Creek	5,000	
Warfield Lake	2,500	
Woodstock Pond	2,500	
Sebowisha, Caney Fork River	4,000	
Smith Fork Creek	4,000	
Selmer, Expansion Lake		500
Sequatchie, Alum Cove Lake		150
Lake No. 1		150
Sevierville, Cresswell's mill pond		100
Little Pigeon River, East Prong		250
Little Pigeon River, West Prong		550
Pigeon River		100
Shelbyville, Duck River		750
Shirleyton, Shirley's lake		150
Sparta, Caney Fork River		45
Spring City, Piney Creek		40
Springfield, Thaxton's pond		200
True Pond		165
Tate Spring, German Creek		200
Tellico Plains, Lake Tellico		175
Tellico River		175
Thompson, Ridley's pond		15
Toone, Anderson's pond		500
Townsend, Little River		400
Tullehoma, Cumberland Springs Lake		15
Lake Calanthe		45
Tyner, Bonny Oaks Lake		20
Walling, Moneyham's pond		200
Sanders's pond		15
Waverly, Hurricane Creek		1,000
Whiteville, Hailey's pond		1,000
Whitlock, Mandle Lake		1,000
Texas:		
Abilene, Bass Lake		75
Lytle Lake		2,400
Albany, Home Pond		2,000
Alto, Four Mile Lake		1,000
Amarillo, Long Hole Lake		932
Palo Duro Creek		2,960
Annona, Brazos Lake		2,000
Clear Lake		2,000
Texas—Continued.		
Annona, Crystal Lake (A)		75
Crystal Lake (B)		2,000
Archer City, Carver Lake		2,700
Athens, Chalmers's Lake		800
Koon Kreek Lake		3,750
Richardson Lake		2,500
Atlanta, Baucum's pond		300
Chamblee's pond		300
Austin, Asylum Lake		1,250
Lake Austin		10,512
Axtell, Cox Farm Lake		500
Everman Club Pond		2,500
Lumbley's pond		500
Baird, Railroad Lake		2,000
Bastrop, Burleson's pond		1,000
Country Club Pond		1,080
Davis's pond		2,400
Young's lake		1,000
Bedias, Willow Pond		100
Wilson's pond		500
Benbrook, Bear Creek		1,050
Big Springs, Parramore's ponds		3,000
Bivins, Woodworth Pond		75
Blooming Grove, Dorsey's pond		2,400
Lower Lake		2,875
Blossom, Cole's pond		1,000
Bonham, Lake St. Clare		1,000
Brandenburg, Brandenburg Pond		2,400
Brandon, Cottonwood Creek		1,600
Giles Pond		1,200
Bremond, Causey's pond		1,200
Forson's pond		600
Brenham, Brenham Club Lake		4,464
Parker's lake		1,000
Brownwood, Brick Yard Lake		2,276
Brownwood Lake		2,375
Camp's pond		100
Simmons's pond		225
Stock Pen Lake		100
Bruni, San Pedro Pond		1,600
Bryan, Adelles Lake		1,300
Floyd's lake		500
Steep Hollow Lake		700
Woodland Lake		1,000
Bullard, Spring Lake		1,000
Campbell, Cannon's pond		800
Center, Bailey's pond		40
Black's lake		600
Samford's pond		600
Childress, Hawkins Pond		466
Robbins Pond		466
Cibolo, Mueller's pond		1,400
Cleburne, Country Club Lake		2,000
Cline, Turkey Creek		4,000
Coleman, Coleman Lake		100
Wells Lake		50
Columbus, Miller House Lake		125
Wolf Pen Lake		125
Comfort, Cypress Creek		1,400
Corpus Christi, Poenisch Lake		3,000
Crockett, Nunn Lake		650
Parish Lake		1,820
Crystal City, Nueces River		1,370
Daingerfield, Donald Dell Pond		1,600
Dalhart, James's pond		740
Dallas, Harris Lake		900
Prairie Creek		900
State Hatchery Pond		500
Del Rio, Cienegas Creek		800

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Texas—Continued.		
Denton, Taylor's lake		1,600
Derby, Harkness's pond		800
Detroit, Cherry's pond		75
Inzer's pond		75
Mathis's pond		75
Douchette, Bostick Branch		2,000
Eastland, Lake Tullia		2,000
Edna, Alligator Lake		1,600
Horse Shoe Lake		1,600
Laughter Lake		1,600
Sayles Lake		1,600
Westhoff's lake		1,600
Willow Bud Lake		800
El Paso, Smelting Works Pond		150
Falfurrias, Arcadia Lake		1,000
Fletcher, Village Creek		2,875
Fort Worth, Lake Worth		3,650
Franklin, Fulton's pond		75
Fredericksburg, Bear Creek Lake		700
Lipan Lake		1,200
Pedernales River		380
Frost, Halbert Farm Pond		2,400
Jones Ranch Pond		1,900
Fulshear, Mayes Lake		120
Gainesville, Elm Creek		2,400
Lame Duck Pond		1,600
Priddy's pond		50
Garrison, Greenwood Lake		2,000
Gause, Thomas's lake		75
Giddings, Dunks Lake		700
Steglich Lake		285
Goldthwaite, Wood Lake		50
Gordon, Dairy Farm Lake		300
Granbury, Cogden's pond		1,138
Grandview, Country Club Lake		100
Pecan Lake		1,000
Grigsby, Hanna Lake		500
Gunter, Gunter Lake		1,800
Gustine, Nigs Branch		1,500
Hallettsville, Lavaca River		2,000
Happy, Lake View		500
Harleton, Harleton Lake		1,600
Haskell, Hemphill Lake		700
Hearne, Vaughan's pond		125
Heidenheimer, King's pond		50
Hempstead, Royal Lake		1,000
Henderson, Brown Lake		3,400
Stafford Lake		2,500
Henrietta, Callaway's pond		466
Highbank, Sutherland's pond		1,800
Howland, Shelton Lake		520
Hubbard, City Lake		1,000
Club Lakes		925
East Pond		1,250
Jones's pond		125
McDaniel's pond		2,000
Waterworks Lake		425
Iredell, Bosque River		7,150
Itasca, Martin Lake		1,000
Jayton, Lake Luzon		700
Justiceburg, Herd Pasture Pond		1,000
Railway Lake		1,600
Katy, Hammon Pond		1,000
Kemp, Barnett's pond		1.000
Berry Lake		2,000
Bull Frog Lake		1,000
Button Willow Lake		1,000
Cedar Lake		1,000
Texas—Continued.		
Kerens, Twin Ponds		3,000
Kerrville, Crenshaw Pond		800
Dietert Pond		800
Floyd's pond		800
Goat Creek		1,000
Guadalupe River		2,400
Guadalupe River, South Fork		1,400
Harris Lake		700
James Pond		800
Lake Cawthrone		800
Lake Mae		800
Lowry's pond		800
Moore Pond		800
Ragland's pond		800
Rees Pond		800
Sauer Pond		1,000
Schreiner Lake		1,600
Kingsbury, Upham Lake		3.500
Kosse, Oil Mill Pond		600
Laredo, St. Thomas Lake		150
La Rue, Flag Lake		690
Las Vegas, Jantz's pond		300
Lawrence, Wallace's pond		350
Leesburg, Ferndale Lake		900
Woodland Pond		800
Lewisville, San Lake		1,200
Lincoln, Dube's pond		60
Llano, Hickory Creek		2.400
Llano River		3.200
Six Mile Creek		2,100
Spice Wood Springs Run		1,600
Wrights Creek		1,900
Long Branch, Grubenman Lake		1,250
Longview, Fuller's lake		2,400
Lake Devonia		4,000
Lake Moberly		3.200
Renfroe's lake		150
Texas & Pacific Lake		2,400
Lovelady, Smith's pond		650
Standley's pond		650
McKinney, Andrew's pond		650
Sloan Lake		650
Mabank, Andrews Lake	2,500	
Barnett's pond		880
Cook's pond		1,000
Craft's pond		1,000
Flag Lake	2,500	
Manchaca, Onion Creek		100
Marathon, Maravillas Creek		1,600
Pena Colorado Creek		800
Marfa, Brite's pond		75
Marion, Cibolo River		1,050
Grobe's pond		700
Loefler's pond		1,400
Radtke's pond		600
Wieters & Luensmann's pond		700
Winkleman's pond		300
Menard, Clear Creek		4,554
Mercury, Bull Branch		3,416
Meridian, Carlson's pond		50
Sunnyside Lake		100
Merkel, Live Oak Lake		1,000
Mertens, Buie's pond		1,200
Mexia, Stubenranch's pond		600
Milano, Butts's pond		75
Mineola, Conger's pond		250
Denton's pond		250
Mineola Club Lake		150

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Texas—Continued.		
Mineola, Smart's pond		375
Mineral Wells, Dark Valley Creek		550
Navasota, Steele Lake		1,300
Neuville, Hatton's pond		600
McSwean's pond		550
MountPleasantPond		600
Teneha Bay, South Head		600
Newark, Williams's pond		900
New Boston, DeS hong's pond		2,000
New Braunfels, Comal River		5,100
Comal River, North Branch		3,000
Guadalupe River		150
Norvotney's lake		250
Old Comal Creek		4,000
RebeccaCreek		1,600
SpringBranch		150
Newsome, Elmwood Pond		800
Orth, Leberman's pond		900
Otto, Gin Company Pond		900
Paige, Fox Pond		50
Panhandle, Russ's pond		1,000
Paris, Clear Lake		1,000
Gin Pond		1,000
Paxton, Fair View Pond		1,000
Peacock, Forty One Tank Pond		1,200
Pearsall, Artesian Farm Pond		800
Petrolia, Lake Gage		1,800
Pine, Lawton Lake		8,000
Pittsburg, Jersey Dale Pond		450
Reaves Club Lake		1,600
Plainview, Reaves Lake		500
Tulia Creek		1,850
Point, Simmons's pond		650
Ponder, Cliff Lake		50
Prosper, Rhea Mill Pond		2,700
Quinlan, San Creek		2,400
Sycamore Pond		700
Ranger, Houston Lake		1,000
Palo Pinto Lake		2,400
Reagan, Harlan's pond		170
Rice, Rutherford's pond		800
Rockwall, Lofland's pond		75
Watch Lake		650
Rosebud, Atkins's pond		2,000
Estes Pond		1,000
Souther's pond		900
Rotan, Dennis's pond		700
San Angelo, Johnson's pond		360
San Antonio, Lake Esperanza		150
Lamm's lake		420
Raybould Lake		420
San Antonio River		2,025
San Pedro Springs Lake		150
Southton Lake		420
Terrell's pond		75
West End Lake		4,000
White's pond		150
San Marcos, Bagley Lake		2,235
Blanco River		7,202
Horse Shoe Lake		4,300
Howard Pond		321
Jackman Lake		1,075
San Marcos River		1,000
Texas—Continued.		
San Saba, Miller Lake		3,416
Schertz, Cibolo Nursery Pond		700
Seguin, Church Hill Lake		2,100
Guadalupe River		375
Mill Creek		375
Smithville, Lidiak Pond		235
Snyder, Moores Creek		75
Spofford, Gablen Pond		40
Vincent's pond		80
Spur, Wilson Creek Pond		2,400
Stamford, Hosey Lake		50
Standart, Mud Creek		120
Sulphur Springs, Butler's pond		800
Ponder's pond		800
Templeton Pond		800
Willow Lake		800
Young's pond		800
Sweetwater, Santa Fe Lake		2,400
Taylor, Flag Springs Lake		75
Temple, Lake Polk		260
Terrell, Hunters Pond		700
Whites Lake		700
Texarkana, Dripping Spring Lake		900
Spring Lake		600
Thorndale, City Pond		1,600
Elliott Lake		75
Elm Grove Pond		75
Gregory's pond		75
Melde's pond		75
Michalk Lake		3,700
Newton Pond		1,675
Phillips's pond		35
Ryan's pond		60
Thorndale Pond		3,200
Water & Light Company Lake		75
Timpson, Lake View		1,000
Smith's pond		1,000
Tulia, Butcher Great Lake		1,000
Lake Saratoga		1,000
Tyler, Crystal Lake		2,250
Uvalde, Evans Lake		800
Frio River		2,050
Frio River, West Prong		4,000
Leona River		2,850
Nueces River		1,250
Turkey Creek		2,050
Upper Dry Frio River		1,600
Upper Leona River		1,600
Upper Nueces River		1,600
Vernon, Hiatt's pond		466
Shapley Pond		466
Waco, Elk Lake		1,600
Goodman Valley Lake		1,150
McCowans Lake		75
Sand Lake		800
Watt's lake		75
Weathered Lake		75
Waelder, Taylor's pond		250
Waller, Wilson's pond		50
Walnut Springs, Lake Wistaria		1,050
Waxahachie, Robinson Pond		80
Weatherford, Prairie View Lake		550
Westover, Lake Westover		700
Stevens Lake		700
Wharton, Caney Creek		3,200

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Texas—Continued.		
Wichita Falls, Coleman Lake		1,800
Flag Creek		466
Marcus Lake		900
Scotland Lake		1,800
Wichita Club Lake		1,800
Wilson Lake		1,800
Wills Point, Bird Lake		800
Bourland Lake		800
Brushy Lake		800
City Lake		800
Constant Lake		700
Dawson's pond		350
Elm Lake		700
Goodwin Lake		800
Hamilton Lake		350
Jameson's pond		350
Kirby Lake		800
Lake Breucher		700
Lake Champion		800
Lake Gilchrist		800
Lake Grooms		800
Lake Hubbard		700
Lake Human		700
Lake Jarvis		800
Lake Manning		800
Lake McKnight		800
Lake Thelma		800
Lake Thorne		700
McLean Lake		350
Meredith Lake		800
Owens Lake		800
Thorn Lake		350
Wynne's lake		700
Winnsboro, Pittman's pond		450
Spring Dale Pond		800
Utah:		
Collingston, Bear River		55
Murray, Froiseth's pond		15
Price, Jeffs's pond		15
Virginia.		
Abingdon, Sunny Brook Pond	1,000	
Amelia, Rowlett Mill Pond		200
Southall's pond		150
Backbone, Dunlap Creek		80
Berryville, Shenandoah River		150
Blackstone, Bellmont Pond		200
Hammock's pond		100
Bowlers Wharf, Melbourne Pond		200
Bremo, Lower Bremo Pond		500
Moss Pond		100
Broadway, Shenandoah River, North Branch		2,000
Burkeville, Miller's mill pond		200
Byllesby, Crooked Creek		2.100
New River		2,100
Carysbrook, Rivanna River		225
Cave Station, North River		200
Centralia, Court House Pond		200
Charlottesville, Rivanna River		200
Chester, Ware Mill Pond		100
Chilhowie, Holston River, South Fork		300
Clifton Forge, Cowpasture River		2,400
Covington, Dunlap Creek		800
Potts Creek		1,600
Dooms, Shenandoah River, South Fork		400
Duffield, Duff's pond		50
Robinette's pond		100
Edinburg, Shenandoah River, North Branch		1,600
Virginia—Continued.		
Elkton, Shenandoah River		1,600
Emporia, Pair's pond		200
Evington, Brookdale Pond		100
Fall Creek, Campbell's pond		200
Harper's pond		600
Fall Mills, Mud Fork Creek		200
Farmville, Burger's pond		100
Forest Depot, Yancey's pond		3,000
Fort Mitchell, Watson's pond		100
Gate City, Corns's pond		50
Gladys, Seneca Creek		300
Glen Allen, Cussons Pond		100
Granite, Quarry Pond		100
Green Spring Depot, Mellington Lake		300
Gretna, Stinking River		200
Griffith, Cowpasture River		200
Harrisonburg, North River		400
Shenandoah River		600
Honaker, Smith's pond		100
Hot Springs, Cowpasture River		150
Jackson River		150
Island Ford, Shenandoah River		400
Ivanhoe, Cripple Creek		2,100
New River		3,500
Poplar Camp Creek		2,100
Jasper, North Fork Creek	3,000	
Lee, Woodbury Pond		300
Lovetsville, Dutchman Creek		1,000
Maidens, Carlisle Pond		1,400
Markham, Rappahannock River		250
Middletown, Shenandoah River, North Fork		125
Millboro, Lick Run		800
Mount Crawford, North River		400
Mount Jackson, Stony Creek		400
Mundy Point, Northern's mill pond		400
Myrtle, Simmons's pond		100
Narrows, Wolfe Creek		300
Newcastle, Craig Creek		500
Johns Creek		400
Newsome, Barham & Pope's pond		400
Norge, Seminole Pond		200
Orange, Mathews Mill Pond		200
Oriskany, Craig Creek		300
Paeonian Springs, Kittocton Creek		300
Palmyra, Montvale Mill Pond		100
Pemberton, Smith's pond		100
Pembroke, Mountain Lake		300
Pendleton, Purdell & Woodson Pond		100
Petersburg, Iveys Mill Pond		100
Linkin Creek		200
Swift Creek	3,000	300
West End Park Lake	2,000	200
Plains, Goose Creek		1,370
Providence Forge, Allen Pond		200
Dead Creek		100
Dearhardt's pond		200
Drewry's pond		2,100
Forge Pond		200
Garrett Pond		400
Lakeside Lake		200

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Virginia—Continued.		
Providence Forge, Long Reach Pond		200
Mirror Lake		500
Townsend Pond		200
Westhampton Lake		200
Randolph Depot, Pond de Lake Charlotte		100
Rapidan, Taliaferro's pond		70
Remington, Kelly Pond		200
Richmond, Brandy Mill Pond		200
Browns Pond	3,000	
Chickahominy Club Pond		100
Club Pond	2,000	
Cotton Pond	3,000	
Falling Creek	2,000	
Hickory Hill Pond		100
Licking Creek Pond	2,000	
Skidmore Pond	2,000	
Riverton Junction, Shenandoah River		400
Roxbury, Captain Joes Pond		1,400
Charles City Pond		1,400
Palmer's pond		100
Roxbury Pond		1,400
Scottsville, Chester Pond		700
Skelton, Meherin Creek		300
Spencer, North Mayo Creek		300
Staunton, Churchville Branch		150
Middle River		300
Stony Creek, Hunting Quarter Pond		200
Nottaway River		500
Sutherlin, Atlas Mills Pond		100
Toano, Goddin's pond		200
Toshes, Frying Pan Creek		100
Tye River, Cabell's pond		100
Walkers, Mattahunk Lake		500
Walker Ford, James River		2,100
Warrenton, Carters Run		200
Waynesboro, South River		125
Westham, Bryans Pond		700
Dancing Creek Pond		300
West View, Vaughan's pond		100
Whittles, Mills's pond		200
Williamsburg, Highland Pond		600
Wirtz, Blackwater River		300
Woodslane, Pollys Pond		200
Woodstock, Shenandoah River, North Fork		400
Wytheville, Reed Creek	3,000	
Reed Creek, South Fork	3,000	
Yale, Graves's pond		75
West Virginia:		
Albright, Big Sandy Creek		75
Alderson, Greenbrier River		80
Bluefield, Bailey Lake		100
Cameron, Fish Creek		36
Chapmanville, Guyandotte River		120
Charleston, Big Buffalo Creek		150
Blue Creek		150
Elk River		150
Cowen, Gauley River		75
Fairmont, Prickett's pond		50
Great Cacapon, Great Cacapon River		400
Haywood, Ten Mile Creek		24
Junior, Tygarts Valley River		24
Logan, Guyandotte River		120
West Virginia—Continued.		
Long Run, Middle Island Creek, Meat House Fork		24
Morgantown, Tibbs Run Lake		50
Mullens, Guyandotte River		500
Oral, Oral Pond		120
Paw Paw, Cacapon River		800
Romney, Potomac River, South Branch		1,000
Ronceverte, Greenbrier River		5,000
Talcott, Indian Creek		100
Terra Alta, Lake Terra Alta		400
Weston, Monongahela River, West Fork		100
Wheeling, Speidel's pond		12
Wisconsin:		
Birchwood, Spring Lake		50
Bloomer, Bloomer Mill Pond		300
Cable, Bass Lake		50
Cable Lake		50
Rosa Lake		50
Cumberland, Beaver Dam Lake		50
Buck Lake		50
Duck Lake		50
Granite Lake		50
Horse Shoe Lake		50
Kidney Lake		50
Kirbec Lake		50
Little Bass Lake		50
Little Sand Lake		50
Pipe Lake		50
Sand Lake		50
Silver Lake		50
Spirit Lake		50
Wickerts Lake		50
Wild Cat Lake		50
Delaven, Round Lake		70
Fall Creek, Fall Creek Pond		100
Frederic, Diamond Lake		50
Gordon, Bass Lake		50
Clear Lake		50
Ox Lake		50
Hawkins, Shamrock Lake		300
Hayward, Bass Lake		50
Buck Lake		50
Clear Lake		50
Devils Lake		50
Flat Lake		50
Lake Court O'Reille		150
Smith Lake		50
Spring Lake		50
Whitefish Lake		50
Iron River, Swanson Lake		150
La Crosse, Black River		200
Broken Gun Run		100
French Lake		150
Lyths Bay		150
Nichols Bay		200
Rice Lake		200
Running Creek		150
Ladysmith, Flambeau Pond		400
Lake Stephenson		200
Lake Nebagamon, Deer Lake		50
Deer Print Lake		50
Gander Lake		50
Island Lake		50
Loon Lake		50
Minneseng Lake		50
Sand Bar Lake		50
Steele Lake		50
Lampson, Ferguson Lake		150

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.		
Manitowoc, English Lake		70
Glombsky Lake		70
Goss Lake		70
Hampton Lake		70
Hartlaubs Lake		70
Kastbaums Lake		70
Pigeon Lake		70
Mazomanie, Lake Marion		75
Mellen, Billett Lake		100
Caroline Lake		150
English Lake		100
French Lake		150
Long Lake		150
Loon Lake		150
Meader Lake		100
Mineral Lake		100
Twin Lakes		300
Merrillan, Mill Pond		50
Trows Pond		50
Minong, Lake Hensen		150
New Auburn, Chain Lake		300
New Richmond, Cedar Lake		50
Willow River		50
Phelps, Little Bass Lake		200
North Twin Lake		600
Rice Lake, Ginder Lake		50
Heinrich Lake		50
Moon Lake		50
Tuscobia Lake		50
Roberts, Twin Lakes		100
Sparta, Angelo Pond		75
Bacon Pond		60
La Crosse River		115
McCoy Pond		50
Perch Lake		75
Spider, Spider Lake		150
Wisconsin—Continued.		
Spooner, Big McKenzie Lake		50
Spring Green, Wisconsin River		150
Stanberry, Trinace Lake		50
Stone Lake, Big Sissabagama Lake		50
Fish Lake		50
Flat Lake		50
Ham Lake		50
Hungry Lake		50
Little Sand Lake		50
Little Sissabagama Lake		50
Sand Lake		50
Sugar Bush Lake		50
Three Lakes, Green Bass Lake		150
Pickerel Lake		150
Range Line Lake		150
Virgin Lake		150
Whitefish Lake		150
Tomah, Kenyon Pond		50
Tomah Lake		75
Wascott, Miles Lake		150
Wausau, Bass Lake		100
Big Rib River		100
Lake Go To It		100
Little Rib River		100
Mayflower Lake		100
Pike Lake		100
Wyoming:		
Cheyenne, Lake Minnehaha		180
Sloans Lake		270
Glenrock, Dry Creek		180
Moorcroft, Gammon Lake		120
Sheridan, Tracy's pond		60
Total[a]	758,300	1,431,850

SUNFISH.

Alabama:		
Allenton, Bonner's pond		200
Altoona, Peeple's pond		175
Andalusia, Clark's pond		150
Arlington, Dumas's pond		200
Birmingham, Eubanks's pond		200
Number Twelve Pond		400
Blocton, Morse's pond		200
Brent, Bailey's pond		200
Calera, Dry Creek		160
Clayton, Blakey's pond		110
Bradley's pond		220
Helms Pond		165
Ventress Pond		215
Coatopa, Spidle's pond		200
Daleville, Cow Pen Creek		400
Eoline, Hobson's pond		1,000
Evergreen, Cane Creek		320
Dey's pond		240
Sandy Creek		400
Utopian Club Lake		240
Goshen, Heath's pond		75
Guin, Motes & Markham's pond		500
Guntersville, Railroad Pond		200
Ida, Lock Twelve Lake		1,000
Jasper, Black Water River		500
Evans's pond		200
Foster's pond		200
Alabama—Continued.		
Jasper, Kilgore's pond		500
Long's pond		500
Sims's pond		500
Lineville, Gaines's pond		90
Wolf's pond		90
Lockesburg, Coulter's pond		16C
Louisville, Cunningham's pond		100
McWilliams, Philpot's pond		200
Megargel, Smith's pond		200
Midway, Morton's pond		110
Montgomery, Hill's pond		100
Holt's pond		240
Little Whitewater Lake		600
Montgomery Pond		750
Opp, Kelsoe's pond		160
Mills's pond		80
Perdue's pond		160
Orrville, Moseley's pond		200
Ozark, Anglin's pond		55
Pell City, Lake St. Clair		270
Phoenix, Magnolia Pond		75
Morgan's pond		140
Pine Hill, Sheffield's pond		200
Prattville, Smith's pond		60
Pyriton, Brown's pond		90
Rowland's pond		450
Red Bay, Jordan's pond		200

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[a] Lost in transit, 13,254 fingerlings.

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

SUNFISH—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Alabama—Continued.		
Repton, Dees's pond		200
Russellville, Burgess's lake		200
Cobb Springs Pond		200
Elliott's pond		200
Lake Charles		200
Lake Gayley		400
Seale, Holland Pond		210
Old Pearce Pond		375
Pearce Pond		300
Sterrett, Bear Creek		275
Kellys Creek		275
Sulligent, Woods's pond		500
Three Notch, Johnston's pond		110
Troy, Henderson's pond (A)		75
Henderson's pond (B)		150
Henderson's pond (C)		140
Tuscaloosa, Pine Terrace Pond		200
Tuskegee, East View Pond		60
Tyler, Minter's pond		200
Union Springs, Eley's pond		140
Gholston's pond		75
Wetumpka, Gay Springs Pond		60
Arizona:		
McNeal, Whitewater Pond		200
Simon, Barton's pond		200
Darsey's pond		200
Oasis Ranch Pond		200
Thompson's pond		200
Triangle Ranch Pond		200
Arkansas:		
Chichester, Clark's pond	15,000	
Conway, Halter's pond		100
El Dorado, Business mens' Club Lake		200
Emerson, Stevens's pond	15,000	
Hermitage, Ferguson's pond		497
Magnolia, Benvenue Pond	24,000	
Elmore's pond	9,000	
Lewis's pond		75
Souter's pond		75
Nashville, Clark's pond		110
Warmack's pond	15,000	
Patmos, Hollis's pond		50
Prescott, Blakeley's pond		100
Brandon's pond		50
Hallaway's pond		50
Wortham's pond		50
Paragould, Hill Crest Pond		135
Ravana, Dodd's pond	15,000	
Vandervoort, Bog Springs Pond		160
Wilmot, Lake Enterprise		150
Womble, Edwards's pond	6,000	
Woodson, Lake Ferguson		150
Delaware:		
Laurel, State Farm Pond		400
District of Columbia:		
Washington, McLean's pond		234
Florida:		
East Lake, Lake Weir		800
Jacksonville, Cedar Spring Pond		100
Lloyd, Virginia Lake		450
Olympia, Hawkins Pond		300
Ochlavilla Lake		450
St. Cloud, Lake East Tohopekaliga		1,000
Georgia:		
Adel, Juhan's pond		300
No Mans Friend Pond		100
Pope's pond		200
Alapaha, Alapaha River		600
Alma, Stewart's pond		200
Georgia—Continued.		
Americus, Brown's mill pond		450
Councils Mill Pond		450
Seals Mill Pond		800
Andersonville, Hodges's pond		200
Atlanta, Boulevard Pond		100
Brodnax's pond		300
Durand's pond		200
East Lake		400
Augusta, Clark's pond		150
Enquert Pond		300
Horse Pen Pond		375
Bainbridge, Chason Springs Run		300
Barney, Ryall's pond		450
Baxley, Hollis's pond		300
Beach, Sweat's pond		450
Bellville, Bazemore's pond		450
Black Pond		300
Berryton, Garvin's pond		150
Bethlehem, Harris's pond		200
Bowdon, Ballard's pond		100
Box Springs, Lake Samokee		1,040
Broxton, Lumber Company Pond		300
McGovern's pond		200
Ricketson's pond		600
Bullochville, Butts's pond		45
Cold Brook Pond		200
Carrollton, Lowell Pond		100
Mote's pond		100
Pittman's pond		150
Reagan & Stevens's pond		100
Cedar Bluff, Newberry's pond		300
Clarkston, Seay's pond		200
Columbus, Garrard's pond		200
Massey Pond		200
Mossy Lake		300
Pou Brothers Pond		200
Conyers, Yellow River		500
Cordele, Cato's pond		450
Cusseta, Hollis's pond		200
Dakota, Gin Pond		150
Davisboro, Tarver Mill Pond		300
Douglas, Vickers's pond		300
Douglasville, Eason's pond		150
Elberton, Gum Pond		200
Ellijay, Geneva Lake		300
Folkston, St. Marys River		800
Forsyth, Persons's pond		200
Gibson, Griffen's pond		150
Grantville, Cotton's pond		200
Greenville, Terrell's pond		1,300
Greenwood, Greenwood Pond		100
Griffin, Lake Rushton		300
Harlem, Blanchard's pond		150
Hartwell, Furgerson's pond		200
McCurry's pond		200
Higgston, Morris's pond		300
Hiram, Hays's pond		100
James, Golden Hargreet Pond		200
Jimps, Kennedy's pond		450
Mill Pond		450
Junction City, Brown's pond		300
La Crosse, Holloway's pond		300
Lake Park, Long Pond		450
Lawrenceville, King's pond		300
Luthersville, Chandler's pond		200
McDonough, Greene's pond		150
McIntyre, Deason's pond		400
Parker's pond		400
Macon, Green Briar Pond		150
Huhn's pond		150

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

SUNFISH—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Georgia—Continued.		
Macon, Jordan's pond		300
Miller's pond		150
Powell's pond		100
Rice Mill Pond		300
Roberts's pond		200
Striplin's pond		200
Manchester, Routon's pond		200
Maysville, Holland's pond		200
Metter, Aldred's pond		200
Milledgeville, White Lake		300
Millen, Big Buckhead Creek		1,050
Morrow, McLeod's pond		150
Munnerlyn, Mill Pond		450
Nankipooh, Ford's pond		300
Newman, Bailey's pond		200
Norwood, English's pond		150
Jones Pond		600
Ochlocknee, Bonnet Pond		400
Gum Pond		150
Ocheesee Pond		200
Poplar Pine Pond		200
Spring Pond		400
Ocilla, Griffin Pond		200
Palmetto, Johnson's pond		200
Pelham, Mill Pond		150
Pidcock, Byrd Pond		200
Poulan, Stevens's pond		200
Quitman, Quitman Lake		500
Raymond, Maple Lake		200
Register, Lotts Creek		600
Powell's pond		200
Renfroe, Dillard's pond		500
Reynolds, Ricks Mill Pond		400
Riceboro, Baxter's pond		600
Roberts, Hartman's mill pond		450
Rome, De Soto Park Lake		200
Fouche Mill Pond		300
Hammond Mill Pond		200
Texas Valley Pond		300
Wright Mill Pond		200
Savannah, Park Pond		100
Sharpsboro, Ingram's pond		100
Shingler, Young's pond		300
Soperton, Gillis's pond		300
Moxley's pond		250
Statesboro, Newsome's pond		300
Stillmore, Perkins's pond		200
Summerville, Montgomery's lake		300
Raccoon Creek Pond		300
Suwanee, Spence's pond		200
Swansboro, Ohoopee River		2,000
Sycamore, Tucker's pond		300
Sylvania, Blue Spring Pond		200
Sylvester, Chapman's pond		300
Tarrytown, Calhoun's pond		200
Thomasboro, Thomasboro Pond		100
Thomasville, Magnolia Pond		200
Ouzts's pond		500
Thomson, Smith's pond		125
Tifton, Hutchinson's pond		300
International Pond		100
Mill Creek		200
Webb's pond		750
Tyrone, Head's pond		100
Unadilla, Bule Lime Pond		100
Waynesboro, Chandler Mill Pond		300
Godbee's pond		100
Sapp's pond		650
Whigham, Moore's pond		200
White Plains, Grimes's ponds		400
Willacoochee, Fresh Pond		300
Georgia—Continued.		
Wrens, Anderson's pond		100
Prescott's pond		300
Zirkle, Little Satilla River		400
Illinois:		
Dorchester, Hauschild's pond		200
Freeport, Pecatonica River		5,500
Yellow Creek		5,000
Lake Zurich, Lake Zurich		600
Libertyville, Insull's pond		800
Meredosia, Meredosia Bay		300
Quincy, Illinois River		1,000
Savanna, Tomlinson Run		3,000
Trivoli, Lake of Dreams		200
Indiana:		
Goshen, Elkhart River Pond		400
Plymouth, Forge Lake		300
Lowerys Lake		300
Myers Lake		300
Pretty Lake		300
Topeka, Dallas Lake		400
Meesic Lake		400
Iowa:		
Bellevue, Mississippi River		809.490
State fish commission		5,000
Harlan, Willow Shade Pond		200
Iowa Falls, Iowa River		6,000
Manchester, Maquoketa River		500
North McGregor, Mississippi River		326,940
St. Marys, Minch's pond		150
Kansas:		
Colby, Middle Sappa Pond		400
Columbus, Ellis's pond		200
Hiattville, Lake Alice		300
Morrow, Rock Wall Pond		100
Paola, Wea Bull Creek		700
Pittsburg, Scholl Pond		440
Richmond, Richmond Pond		1,000
Welda, Welda Lake		1,000
Kentucky:		
Clay City, Red River		600
Cynthiana, King's pond		200
Danville, Caldwell's pond		75
Dunn's pond		150
Elizabethtown, Perceful's pond		200
Eminence, Moss's pond		100
Franklin, Dixon's pond		100
Logan's pond		100
Ray's pond (A)		100
Ray's pond (B)		100
Ray's pond (C)		100
Glencoe, Eagleston's pond		200
Guthrie, Duffy's pond		100
Hardinsburg, Hendrick's pond		100
Henderson, Hall's pond		100
Spring Garden Pond		100
Lawrenceburg, Saffell Pond		50
Lexington, Lake Ellerslie		400
Reservoir No. 4		1,000
London, Moore's pond		200
Lynn City, Whitmer's pond		100
McNary, Hahn's pond		200
Madisonville, Farm Pond		100
Mulberry Pond		100
Marion, Crayne View Pond		200
Mount Sterling, Folly Branch		425
Hamilton's pond		75
Mill Pond		200
Perry's pond		200
Olive Hill, Tabor's pond		200

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

SUNFISH—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Kentucky—Continued.		
Pewee Valley, Blue Lake	....	600
Pleasureville, Bush's pond	....	100
Hammond's pond	....	100
Shipman's pond	....	200
Richmond, Deatherage's pond	....	200
Trenton, Orr's pond	....	200
Winchester, Bowyer's pond	....	150
Garner's pond	....	200
Hackett's pond	....	200
Tucker's pond	....	100
Louisiana:		
Breaux Bridge, Olivier Pond	....	400
Chatham, Wilhite Lake	....	300
Geismar, Sugar House Pond	....	100
Homer, Dance's pond	....	200
Ida, Adams's pond	....	100
Lake Charles, Brick Company Pond	....	200
Lake Providence, Lake Providence	....	600
Leesville, Magnolia Pond	....	225
Minden, Miller's pond	....	100
Rayne, Bradford's pond	6,000	....
Robeline, Page's pond	15,000	....
Shreveport, Clear Lake	....	100
Vidalia, White Hall Lake	15,000	....
Maryland:		
Brandywine, Posewiro's pond	....	400
Cumberland, Potomac River	....	1,200
Hyattsville, Bellevue Pond	....	390
Glen Echo, Potomac River	....	1,000
Michigan:		
Wetmore, Bass Lake	....	125
Bissell Lake	....	125
Island Lake	....	125
Minnesota:		
Caledonia, Gengler Lake	....	100
Scheck Lake	....	100
Harmony, Upper Iowa River	....	2,100
Hokah, Pettibone Park Lake	....	1,400
Homer, Mississippi River	....	570,640
Mississippi:		
Aberdeen, Butler Creek	....	300
Cypress Lake	....	600
Greer Lake	....	400
Jaudon's pond	....	100
Jones's pond	....	100
Murff's pond (A)	....	100
Murff's pond (B)	....	300
Murff's pond (C)	....	300
Murff's pond (D)	....	300
Stonewall Creek	....	300
Store Lake	....	400
Ackerman, Leonard's pond	....	200
Amory, Cedar Lake	....	300
Bay Springs, Smith & Rasberry's pond	....	200
Blue Mountain, Mountain View Lake	....	400
Booneville, Lauderdale Lake	....	200
Brandon, Weillo's pond	....	200
Brookhaven, Berger's pond	....	200
Byhalia, Roper's pond	....	200
Columbia, Henoger Lake	....	200
Little River	....	200
Columbus, Cox's pond	....	500
Lindamood's pond	....	400
Puckett's pond	....	300
Corinth, Hinton's pond	....	400
Potts's lake	....	600
Crawford, Irby Pond	....	200
Decatur, Decatur Pond	....	200
Ellisville, Sumrall's pond	....	200
Mississippi—Continued.		
Highlandale, Nebo Fish Pond	....	200
Houlka, Burgess Lake	....	200
Iuka, Brinkley Lake	....	200
Jackson, Hinds Pond	....	200
Lee's pond (A)	....	200
Lee's pond (B)	....	200
Simpson Lake	....	700
Wilson's pond	....	200
Kilmichael, Herring's pond	....	200
Kosciusko, Bailey Lake	....	500
Howell's pond	....	200
Spain's pond	....	200
Lake, Stringfellow's pond	....	200
Laurel, Pine Dale Pond	....	200
Lexington, Spell's pond	....	200
Louin, Kennedy's pond	....	200
Louin Pond	....	200
Louisville, Moody's pond	....	200
McCalls, Mullins's pond	....	200
Macon, Bush Brothers Lake	....	200
Daves Pond	....	200
Herman's pond	....	200
Prairie Pond	....	200
Mantee, Blue Pond	....	200
Brick Pond	....	200
Moseley's pond	....	200
Old Field Pond	....	200
Red Pond	....	200
Meridian, Queen City Pond	....	200
South Lake	....	400
Wagner's pond	....	200
Miller, Funderburk's pond	....	300
Natchez, Rose Hill Pond (A)	....	200
Rose Hill Pond (B)	....	200
Rose Hill Pond (C)	....	200
Trout Lake	....	200
Newton, Kennedy's pond	....	400
Round Pond	....	200
Pheba, Cool Pond	....	200
Double Cabin Pond	....	200
Mound Lake	....	200
Philadelphia, Ocobla Creek	....	400
Pocahontas, Robinson's pond	....	200
Port Gibson, School Campus Pond	....	200
Raymond, Epperson's pond	....	200
Hubbard's pond	....	400
Raymond Pond	....	400
Spann's pond	....	200
Red Lick, Brown's pond	....	200
Contentment Pond	....	200
Vause's pond	....	200
Ripley, Spight's pond	....	200
Roxie, Rose Hill Pond	....	200
Sardis, Buckhalter Lake	....	200
Hudson Pond	....	200
Mill Lake	....	200
Round Lake	....	200
Shuqualak, Breckenridge's pond (A)	....	200
Breckenridge's pond (B)	....	200
May's pond	....	400
Mill Pond	....	200
Stallo, Hall's pond	....	200
Starkville, Hogan's pond	....	800
Page's pond	....	500
Thompson's pond	....	200
Steens, John Mark Pond	....	500
Stonewall, Cubley's pond	....	200
Stringer, Stringer's pond	....	200
Summit, Lee Lake	....	200
Tupelo, Big Lake	....	10,000
Jenkins's pond	....	300
Kings Creek	....	5,000
Park Lake	....	20,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

SUNFISH—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Mississippi—Continued.		
Tupelo, Town Creek		5,000
Union, Individual Pond		200
Williams Pond		200
Winstead Pond		200
Vaughan, Willow Pond		200
Wahalak, Persons's pond		600
Water Valley, Payne's pond		200
West, Spring Dell Pond		200
West Point, Black Lake		200
Crump's pond		400
Deane Brothers Lake		500
Dukeminier's pond		200
Ivy's lake		200
Ivy's pond (A)		200
Ivy's pond (B)		200
Ivy's pond (C)		200
Mealer's pond		400
Munger's pond		400
Sandy Pond		400
Winona, Suggett's pond		300
Woodville, Escher's pond		200
Morris's pond		200
Ogden's pond		200
Phares's pond		200
Whetstone's pond		200
Missouri:		
Ferguson, Wabash Club Lake		200
Joplin, Taylor Spring Branch		500
Kansas City, Blue Meadow Pond		200
Fairmount Lake		800
Kearney, Ludwig's lake		400
Lebanon, South End Pond		200
Marshall, Stedem's pond		200
Mexico, Burlington Lake		600
Neosho, Hill's pond		500
Noel, Perry's ponds		800
Oasis, Fish Lake		1,000
Rolla, Ehrlacher's ponds		200
Lake Frisco		400
Mill Creek		500
South Spring Creek		400
Springfield, Whalen's pond		100
Tebbetts, Elley's pond		100
Windsor, Lake Sutherland		400
Montana:		
Glendive, Yellowstone River		500
New Jersey:		
Lake Hopatcong, Lake Hopatcong		2,000
New Mexico:		
Artesia, Clark's lake		300
Porter's pond		300
Columbus, Brooks's pond		200
Corona, O'Neill's pond		200
Deming, Foulks's pond		200
Harmony Ranch Pond		200
Gallup, Mariano Lake		300
Las Vegas, Chupainas Pond		200
Rodeo, Buckelow's pond		200
Epley's pond		200
Smith's pond		200
Roswell, Clark's pond		50
Haynes Park Lake		50
Lea Lake		150
Spring River Lake		100
Taylors Lake		50
Tucumcari, Cedar Grove Pond		400
Cedar Hill Pond		400
New York:		
Binghamton, Chenango River		400
North Carolina:		
Apex, Franks Pond		200
Gunters Pond		390
Mills's pond		500
Benson, Cow Mire Pond		175
Brevard, Lake Brevard		300
Carthage, McNeill's pond		350
Clayton, Ashley's pond		375
Gower's pond		200
Coats, Parrish's pond		175
Conway, Britt's pond		200
Elizabethtown, White Lake		450
Faison, Panther Creek Park Pond		600
Franklinton, Joyner's pond		200
Mitchell's pond		375
Timberlake's pond		375
Fremont, Aycock Pond		350
Gibson, Lake View		750
Greensboro, Little Alamance Creek		200
Troxler Pond		400
White Oak Lake		400
Haw River, Josephine Lake		200
Lake Lily		100
Henderson, Henderson Pond		1,075
Southerland's pond		475
Hendersonville, Nymphea Pond		400
Hickory, Mountain Pond		300
Knightdale, Lake Verna		390
Lake Toxaway, Lake Toxaway		1,000
Langley, Augusta-Aiken Pond		1,000
Lenoir, Glen Serene Pond		300
Lincolnton, McLoud's pond		150
Louisburg, Jackson's pond		500
Lumber Bridge, Little Marsh Pond		500
Lumberton, McWilliams Pond		800
Mebane, Lake Latham		400
Newton, Bridges's pond		600
Overhills, Overhills Lake		1,390
Princeton, Moccasin Pond		550
Proximity, Boone's pond		200
Raeford, Beaver Dam Pond		400
Raleigh, Crystal Lake		200
Lakewood Park Lake		900
Steep Hill Pond		400
Roanoke, Chocoyotte Creek		500
Ronda, Brook's pond		100
Redding's pond		100
Smith's pond		100
Sanford, Drane's pond		90
Smithfield, Stevens's pond		300
Spout Springs, Deep Water Pond		90
Tryon, Lockhart's pond		200
Wake Forest, Jackson's pond		200
Jones's pond		400
Lowry's pond		375
Wendell, Lee Mill Pond		650
North Dakota:		
Addison, Maple River		300
New Salem, Egli's pond		200
Ohio:		
Akron, Turkeyfoot Lake		210
Blacklick, Cedar Creek		100
Canton, Foster's pond		100
Hoover's pond		100
Covington, Stillwater River		300
Findlay, White Lake		200
Girard, Willow Pond		100

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

SUNFISH—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Ohio—Continued.		
Hamilton, Lake View Pond		400
Hebron, Buckeye Lake		400
Lockville, Sycamore Creek		200
Pittsburg, Flat Lake		200
Ravenna, Crystal Lake		500
St. Marys, Lake St. Marys		500
Summerfield, Moore's pond		100
Oklahoma:		
Duncan, Albright's pond		125
Duck Pond		125
Hastings, Waterworks Pond		625
Kiowa, Rose's pond		100
Scrimgeone's pond		110
Mangum, Alta Vista Pond		220
Marietta, Peak Pond		100
Norman, Hospital Lake		125
Oklahoma City, Cut Off Lake		375
Quinlan, Ballin's pond		50
Sapulpa, Cream Ridge Pond		125
Supply, Irwin Lake		220
Tangier, Horse Shoe Lake		50
Sand Creek		50
Texola, Blair's pond		73
Howard's pond		74
Whorton Lake		73
Welch, Harlin's pond		100
Pennsylvania:		
Altoona, Fred Jackel Pond		100
Bellnap, Bellnap Pond		150
Brandymore, Brandymore Pond		1,200
Eagles Mere, Eagles Mere Lake		975
Harmony, Tracey's pond		150
Johnstown, Quemahoning Lake		400
Sugar Run Pond		200
Tub Mill Run		200
Wilmore Pond		400
Jonestown, Swatara Creek		540
Lancaster, Conestoga River		200
Lebanon, Alberts Mill Pond		100
Big Dam Creek		100
Cold Brook Pond		100
Conewago Lake		100
Furnace Creek		540
Lights Pond		100
Little Swatara Creek		200
Oak Grove Creek		100
Orwigsburg, Fausts Pond		180
Phoenixville, Valley Creek		200
Reading, Manatawny Creek		2,100
Schuylkill River and tributaries		4,540
Yeagleys Lake		2,000
Rockmere, Allegheny River		400
South Danville, Echman's pond		60
Spring City, Stony Creek		200
Stroudsburg, Pickerel Lake		400
Tionesta, Allegheny River		500
Windber, Young's pond		100
Porto Rico:		
San Juan, Comerio Lake		600
South Carolina:		
Beldoc, Fowke's pond		200
Doe Pond		200
Belton, Hank's pond (A)		100
Hank's pond (B)		100
Blaney, Heath's pond		300
Cassett, Funderbunk's mill pond		300
Chesterfield, Jacks Branch		200
Clinton, Young's pond		400
South Carolina—Continued.		
Columbia, Goodwin Mill Pond		300
Messers Mill Pond		500
Mill Pond		300
Moore's pond		200
Poore's pond		150
Easley, Smith's pond		200
Engleside, Smith's pond		200
Enoree, Enoree River		1,000
Greenville, Mountain View Pond		400
Hartsville, Segar's pond		300
Honea Path, Williams's pond		200
Lanford, Harmon's pond		300
Leesville, Able's pond		500
McBee, McBee Lake		300
Newberry, Hutchinson's pond		100
Pomaria, Cannon Creek Lake		400
Spartanburg, Lawsons Fork Pond		100
Little Chinquapin Pond		700
Springfield, Goodland Swamp Pond		500
Summerville, Winningham Pond		100
Timmonsville, Highland Park Lake		200
Waterloo, Cato's pond		500
Winnsboro, Owens Pond		300
South Dakota:		
Canning, Elmhurst Lake		200
Claremont, Willow Lake		100
Conde, Ondell's pond		100
Mansfield, Pastor's pond		100
Person's lake		100
Menno, Biorseth's pond		100
Onida, Walnut Grove Pond		100
Pierre, Lake Medoka		150
Rockham, Volkman's pond		100
Summit, Rose Lake		300
Winner, Axland's pond		200
Tennessee:		
Butler, Holly Spring Pond		300
Centerville, Baird's pond		1,000
Clarksville, Red River, South Fork		200
Halls, Chamber's pond		90
Hickory Valley, Pabst's pond		360
Johnson City, Watauga River		2,000
Lewisburg, Brown's pond		200
Memphis, Arnold's pond		180
Nashville, Alley's pond		1,000
Texas:		
Alpine, Austin's pond		75
Tippit's pond		125
Alvord, Swaim's pond		50
Annona, English Lake		150
Athens, Christopher's pond		100
Axtell, Cox Farm Lake		200
Bangs, Snead's pond		100
Bastrop, Prairie Lake		40
Beeville, Brauer's pond		100
Chambliss's pond		100
Blooming Grove, Houston Pond		150
Blossom, Mills's pond		150
Brenham, Brenham Club Lake		100
Tieman's pond		100
Bronson, Polygoche Creek, tributary of		200
Brownwood, Club Lake		150
Laguna del Campo		150

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

SUNFISH—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.
Texas—Continued.		
Brownwood, Smith Lake		375
Caldwell, Alford's pond		100
Elizabeth Lake		100
Calvert, Davis's pond		75
Carthage, Hull's lake		200
Koonce's lake		200
Center, Lane's pond		400
Cheetham, Woodward's pond		100
Clarksville, Lake Grant		200
Stout Lake		150
Como, Gamblin's pond		150
Cooledge, Adam's pond		150
Coupland, Muery Lake		40
Crockett, Frannon Lake		150
Kennedy's pond		150
Dallas, Luck's pond		100
McCoy's pond		50
Denison, Randell Pond		150
Del Rio, Willow Pond		75
Dodd City, Alexander Pond		75
Falfurrias, Arcadia Pond		50
Bonita Vista Pond		50
Del Monta Lake		50
El Salto Lake		50
Esperanza Pond		50
La Esperanza Pond		50
La Mota Pond		100
Fort Worth, Crest Lake		150
Fruitdale, Randall's lake		250
Gainesville, Grade Lake		50
Girvin, Perry & Baker's pond		150
Granger, Smiths Gin Pond		100
Grapeland, Darsey's lake		150
Gum Lake		150
Greenville, Rutherford's pond		200
Hedley, Clark's pond		25
Heidenheimer, Bickly's pond		100
Edds's pond		100
Pleasant Pond		100
Henderson, Baxter Lake		100
Bay Revilo Pond		100
Beaver Lake		200
Griffith's pond		100
Lake Cover		100
Lake Crim		100
Warren's pond		100
Hubbard, Aston Pond		200
Findley Pond		100
Hammer's pond		200
Hood Branch Pond		200
Norris Branch Pond		200
Huntsville, Fielder's pond		100
Jordy's pond		100
Jefferson, McDonald's pond		75
Katy, Joe Eagle Pond		50
Kaufman, Allen Pond		200
Clear Lake		200
Corn Bell Lake		200
Lawson's pond		200
Pyle's pond		200
Snow Pond		200
Kerrville, Duderstad's pond		50
Kilgore, Laird's pond		150
Lampasas, Smith's pond		75
Leesburg, Russell's pond		100
Willow Lake		150
Lockhart, Thoene's pond		40
Longview, Renfroe's lake		150
Lott, Greener's pond		100
Storey's pond		100
Mabank, Cockerell Gin Pond		100
Hearn's pond		100
Marfa, Colquitt's pond		75
Cottonwood Pond		100
Marshall, Loughmoine Lake		75
Mart, East Lake		275
Texas—Continued.		
Mexia, Hughes's pond		140
Jones's pond		150
Midlothian, Belew's pond		50
Milano, Butts's pond		100
Mineola, Brawner Lake		150
Butler Lake		150
Ferndale Lake		150
Fouse Lake		150
Rock Falls Lake		150
Vance's pond (A)		150
Vance's pond (B)		150
Mineral Wells, Kearby's pond		150
Mount Calm, Rush Lake		200
New Boston, Club Lake		150
Missildine's pond		150
Ruff's pond		150
White's pond		150
New Braunfels, Guadalupe River		100
Newsome, Elwood Club Lake		300
O'Brien, Carney Lake		100
Home Lake		100
Overton, Lake Marie		150
Pasche, North Pond		100
Pinehill, Duran & Wylie's pond		150
Pittsburg, Clement's pond		200
Darby's lake		150
Ferndale Club Lake		300
Ravenna, Willow Pond		75
Rosebud, Wiegreffe's pond		100
Saginaw, Wandry Lake		95
Sanderson, Carter's pond		150
Savoy, Brushy Pond		325
Shiner, Miller's pond		100
Snyder, Clements's pond		150
Daniels's pond		75
Sulphur Springs, Thornton's pond		100
Taylor, Hargis's pond		100
Teague, Bermuda Pond		50
Temple, Lake Polk		200
Terrell, Edwards's pond		200
Howell's pond		200
Raley's pond		200
Waters Pond		200
Thorndale, Melde Reserve Pond		100
Timpson, Bryan's pond		200
Willow Lake		200
Trinity, Pope's pond		100
Tyler, Fullers Lake		50
Uvalde, Flowers's pond		50
Waco, McCowans Lake		100
Willis, Smith's ponds		200
Wills Point, Gibbard's pond		200
Wilson Lake		100
Winnsboro, Spring Lake		150
Virginia:		
Beaver Dam, Haw Buck Pond		200
Bedford City, Thomas's pond		200
Blackstone, Adams's pond		200
Brodnax, Moseley's pond		200
Farmville, Miller's pond		150
Keysville, Mekeren Creek		300
Tuggle's pond		300
Watkins's pond		200
Meadow, Rosecrest Farm Pond		200
Richmond, Cottrell's pond		200
Soldiers Home Pond		100
Stoney Creek, Nottaway River		1,650
Suffolk, Norfleet Mill Pond		400

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

SUNFISH—Continued.

Disposition.	Fry.	Fingerlings, yearlings, and adults.	Disposition.	Fry.	Fingerlings, yearlings, and adults.
Virginia—Continued.			Wisconsin:		
Wingina, Eldridge's pond		150	Butternut, Butternut Creek		950
Wytheville, Reed Creek, South Fork		800	Rabbit Creek		450
Tates Run		500	Slimms Lake		500
West Virginia:			Snores Lake		500
Berkeley Springs, Sleepy Creek		2,100	Colfax, Lake Colfax		400
Clarksburg, Bristol Pond		1,100	Frederic, Diamond Lake		800
Grafton, Three Fork Run		300	La Crosse, Colman Pond		400
Junior, Island Pond		100	French Lake		3,000
Liverpool, Deer Lick Pond		100	Mississippi River		372,500
Long Run, Middle Island Creek, Meat House Fork		100	Rice Lake		3,000
Martinsburg, Opequon Creek		1,200	Swift Creek		1,000
Potomac River		1,800	Zeislers Lake		1,000
Oral, Oral Pond		200	Lynxville, Mississippi River		400,000
Spencer, Brannon's pond		200	Onalaska, Black River		4,000
Walkersville, Spaur's pond		100	Total[a]	135,000	2,799,766

PIKE AND PICKEREL.

Disposition.	Fry.	Fingerlings, yearlings, and adults.	Disposition.	Fry.	Fingerlings, yearlings, and adults.
Iowa:			Wisconsin:		
Bellevue, Mississippi River		1,870	La Crosse, Mississippi River		79,500
North McGregor, Mississippi River		1,100	Total		87,846
Minnesota:					
Homer, Mississippi River		5,376			

PIKE PERCH.

Disposition.	Eggs.	Fry.
Connecticut:		
Hop River, Columbia Lake		500,000
Terryville, Long Marsh Pond		500,000
Illinois:		
Chicago, State fish commission	7,000,000	
Havana, State fish commission	8,000,000	
Meredosia, Meredosia Bay		100,000
Napierville, South Quarry Pond		200,000
Indiana:		
Columbia City, State fish commission	3,000,000	
Columbus, White River and tributaries	2,000,000	
Connersville, Village Creek		200,000
Whitewater River		1,000,000
Whitewater River, Nolans Fork		400,000
Williams Creek		200,000
Elkhart, Indiana Lake		500,000
Hamilton, Fish Lake		500,000
Indianapolis, White River		1,000,000
Leesburg, Tippecanoe Lake		800,000
Middlebury, East Lake		500,000
Iowa:		
Adelphi, Adelphi Lake		300,000
Clear Lake, Clear Lake		550,000
Cresco, Upper Iowa River		300,000
Iowa Falls, Iowa River		200,000
Mason City, Lime Creek		550,000
Rockford, Spring Pond		300,000
Spirit Lake, State fish commission	8,000,000	
Kentucky:		
Ashland, Cumberland River		4,500,000
Cornettsville, Big Leatherwood Creek		300,000
Farmers, Cumberland River		600,000
Lexington, Cumberland River		2,000,000
Olive Hill, Cumberland River		600,000
Williamsburg, Cumberland River		400,000

[a] Lost in transit, 2,175 fingerlings.

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

PIKE PERCH—Continued.

Disposition.	Eggs.	Fry.
Maryland:		
Hancock, Potomac River		1,000,000
Rock Hall, Farley Pond		100,000
Massachusetts:		
Greenfield, Connecticut River		500,000
Pecheal Pond		200,000
Power Station Pond		200,000
Palmer, State fish commission	15,000,000	
Waltham, Charles River		300,000
Michigan:		
Alpena, Long Lake		800,000
Belle Isle Park, Detroit River		1,250,000
Caseville, Saginaw Bay		3,000,000
Charlevoix, Harwoods Lakes		400,000
Nolands Lake		400,000
Clyde, Snyder's lake		400,000
Detroit, State fish commission	26,400,000	
Farwell, Minnow Lake		400,000
Otter Lake		400,000
Fremont, Fremont Lake		500,000
Martins Lake		400,000
Third Lake		400,000
Jackson, Finton's lake		200,000
Kawkawlin, Kawkawlin River		500,000
Oscoda, Van Etten River		200,000
Rose Center, Bennett Lake		200,000
Green Lake		400,000
Sanford, Tittabawassee River		500,000
Traverse City, Twin Lake		400,000
Turtle, Clover Leaf Lake		200,000
Walled Lake, Walled Lake		500,000
Yorkville, Gull Lake		500,000
Minnesota:		
Bemidji, Lake Bemidji		300,000
Chisolm, Dewey Lake		100,000
Island Lake		100,000
Long Lake		100,000
McCormick Lake		100,000
Shannon Lake		100,000
Shoepack Lake		100,000
Duluth, Cook Lake		200,000
Horse Shoe Lake		300,000
Harmony, Upper Iowa River		[a] 80
Hokah, Minnesota Lake		200,000
Homer, Mississippi River		[a] 243
Jenkins, Whitefish Lake		400,000
Lakefield, Heron Lake		[a] 60
Lengby, Spring Lake		150,000
Tamarack, Sandy Lake		100,000
Turtle Lake		150,000
Nebraska:		
Gretna, State fish commission	2,000,000	
New Hampshire:		
Concord, Contoocook River		300,000
New York:		
Amsterdam, Galway Lake		500,000
Binghamton, Chenango River		400,000
Susquehanna River		600,000
Cambridge, Hedges Lake		300,000
Lake Lauderdale		300,000
Carleton Island, St. Lawrence River		7,000,000
Colliers, Goodyear Lake		1,000,000
Fox Island, Lake Ontario		7,000,000
Gansevoort, Pine Lake		400,000
Grass Bay, St. Lawrence River		7,000,000
Hudson, Lake Charlotte		500,000
Mud Creek, Lake Ontario		10,400,000
New Paltz, Bonticoe Lake		400,000
New York City, New York Aquarium	500,000	
Parish, St. Marys Lake		500,000
Port Henry, Lake Champlain		800,000
Port Jervis, Little Pond		500,000
Portlandville, Susquehanna Lake		500,000
Riverside, Schroon Lake		1,000,000
Schenectady, Mohawk River		600,000
Wayland, Loon Lake		1,000,000
Youngstown, Niagara River		800,000

[a] Adults.

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

PIKE PERCH—Continued.

Disposition.	Eggs.	Fry.
North Dakota:		
Devils Lake, Devils Lake	2,000,000	400,000
Sweetwater Lake		100,000
Glen Ullin, Curlew Creek		100,000
St. John, State fish commission	5,000,000	
Turtle Lake, Crooked Lake		200,000
Valley City, Sheyenne River		400,000
White Earth, Smeshak Lake		300,000
Ohio:		
Catawba Island, Lake Erie		10,000,000
Cecil, Maumee River		500,000
Isle St. George, Lake Erie		10,000,000
Kellys Island, Lake Erie		13,000,000
Portsmouth, Brush Creek		300,000
Little Scioto River		300,000
Put-in Bay, Lake Erie		10,000,000
State fish commission	247,450,000	
Russells Point, Indian Lake		500,000
Zoar, Tuscarawas River		300,000
Pennsylvania:		
Cherry Tree, Cush Cushion Creek		300,000
Jersey Shore, Pine Creek		1,000,000
Millerstown, Juniata River		500,000
Mill Hall, Axe Factory Pond		500,000
Muncy, Susquehanna River		500,000
New Milford, Middle Lake		500,000
Oaks, Skipback Creek		300,000
Stoyestown, Quemahoning Lake		400,000
Tennessee:		
Clarksville, Red River, West Fork		500,000
Vermont:		
Bennington, Barber Pond		200,000
Lake Hancock		300,000
Woodford City Pond		300,000
Boltonville, Tickleneck Pond		500,000
Brandon, Hickum Pond		300,000
High Pond		400,000
Lake Hortonia		500,000
Burlington, Lake Champlain		64,800,000
East Highgate, Lake Carmi		500,000
Enosburg Falls, Lake Carmi		600,000
Essex Junction, Winooski River		600,000
Fairlee, Lake Mercy		500,000
Ferrisburg, Little Water Creek		700,000
Hardwick, Lake Greenwood		600,000
Johnson, South Pond		300,000
Ludlow, Woodward Pond		300,000
Lyndonville, Bean Pond		500,000
Milton, Lamoille River		1,800,000
Montpelier, Berlin Pond		400,000
Nelson Pond		300,000
Morrisville, Lake Lamoille		500,000
Newport, Pensioners Pond		300,000
North Bennington, Lake Paran		300,000
North Ferrisburg, Cedar Lake		500,000
Rutland, Meadow Lake		500,000
St. Albans, St. Albans Bay		4,800,000
Swanton, Lake Champlain		31,500,000
Missisquoi River		9,200,000
Thompson Point, Louis Creek		1,900,000
Vergennes, Otter Creek		1,700,000
Wallingford, Elfin Lake		300,000
West Swanton, Lake Champlain		17,500,000
Wolcott, Wolcott Pond		500,000
Virginia:		
Bylesby, New River		2,000,000
Clifton Forge, Pike Pond		400,000
Wytheville, Reed Creek		300,000
Wisconsin:		
Bloomer, Cornell Lake		500,000
Centuria, Balsam Lake		50,000
Bass Lake		50,000
Big Lake		50,000
Deer Lake		50,000
Loveless Lake		50,000
Poplar Lake		50,000
Sand Lake		50,000
Gordon, Ox Lake		200,000

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

PIKE PERCH—Continued.

Disposition.	Eggs.	Fry.
Wisconsin—Continued.		
Hayward, Bass Lake		100,000
Berger Lake		100,000
Chief Lake		100,000
Crane Lake		100,000
Fish Trap Lake		100,000
Gordon Lake		100,000
Grafton Lake		100,000
Grindstone Lake		100,000
Gurno Lake		100,000
Hanson Lake		100,000
Hockenbrock Lake		100,000
Island Lake		100,000
Lake Ole		100,000
Little Lac Court O'Reilles		100,000
McCormick Lake		100,000
McElliott Lake		100,000
Moose Lake		200,000
Phag hang han Lake		100,000
Rogers Lake		100,000
Smith Lake		100,000
Tyner Lake		100,000
Whitefish Lake		100,000
Williams Lake		100,000
Hillsboro, Mill Pond		100,000
La Crosse, Black River		1,800,000
Menomonie, Asylum Lake		100,000
Cedar Lake		100,000
Cut Off Lake		100,000
Lake Menomonie		100,000
Manleys Pond		100,000
Moore Farm Lake		100,000
Red Cedar River		100,000
Stump Pond		100,000
New Auburn, Long Lake		100,000
Rice Lake, Bear Lake		100,000
Birch Lake		100,000
Cedar Lake		100,000
Deitz Lake		100,000
Ginder Lake		100,000
Hemlock Lake		100,000
Heurich Lake		100,000
Knudson Lake		100,000
Montanis Lake		100,000
Moon Lake		100,000
Mud Lake		100,000
Pepper Lake		100,000
Prairie Lake		100,000
Sparta, Bacon Pond		100,000
Leon Mills Pond		150,000
Newton Pond		100,000
McCoy Pond		50,000
Stone Lake, Sissabagama Lake		100,000
Tomahawk, Bass Lake		60,000
Crystal Lake		120,000
Lake Clara		120,000
Muskalonge Lake		60,000
Mystic Lake		60,000
Rice River		120,000
Rood Lake		120,000
Somo Lake		60,000
Somo River		60,000
Spirit Lake		120,000
Spirit River		60,000
Tomahawk River		60,000
Wisconsin River		60,000
Wausau, Lake Wausau		240,000
Winchester, Turtle Lake		300,000
Winter, Island Lake		200,000
Total[a]	326,350,000	282,820,383

[a] Lost in transit, 300,000 fry.

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

YELLOW PERCH.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Arizona:			
Yuma, Colorado River			50
Colorado:			
Boulder, Dodd Lake			150
Weisnhorn Lake			150
Connecticut:			
Bethel, Chestnut Ridge Pond			600
Bristol, Old Pond			600
Pine Lake			600
Georgia:			
Cold Springs, Cold Springs Brook			75
Illinois:			
Freeport, Yellow Creek			800
Nokomis, Taylor's pond			150
Savanna, Sand Slough			2,500
Iowa:			
Bellevue, Mississippi River			19,500
Mason City, Lime Creek			80
North McGregor, Mississippi River			13,400
Indiana:			
Bremen, Lake of the Woods			300
Elkhart, Boot Lake			200
Simonton Lake			200
Kentucky:			
Lexington, Bowyer's pond			75
Lake Ellerslie			150
Louisville, Lake Lansdown			75
Morehead, Garten Lake			350
Mount Sterling, Baird Pond			100
Lake Bogie			280
McCormick Pond			100
Scobee's pond			100
Spratt's pond			100
Stale Creek			200
Versailles, Lewis's pond			75
Maryland:			
Accokeek Creek, Potomac River		26,072,000	
Bryans Point, Piscataway Creek		7,534,000	
Potomac River		52,983,000	
Swan Creek		6,638,000	
Cumberland, Fifteen Mile Creek		300,000	
Flintstone Creek		300,000	
Rocky Gap Creek		200,000	
Wills Creek		300,000	
Elk River, Chesapeake Bay		4,100,000	
Green Bank, Susquehanna River		6,400,000	
Havre de Grace, Chesapeake Bay		725,000	
Spesutie Narrows		1,500,000	
Susquehanna River		5,000,000	
Swan Creek		11,000,000	
McDaniel, Lovers Cove Creek		200,000	
Perrymans, Romney Creek		600,000	
Riverdale, Porton's pond		100,000	
Tolchester, Herring Lake		400,000	
Town Point, Bohemia River		6,000,000	
Massachusetts:			
Falmouth, Spectacle Pond			600
Foxboro, Sunset Lake			600
Palmer, State fish commission	10,000,000		
Minnesota:			
Homer, Mississippi River		250,000	35,512
Mississippi:			
Aberdeen, Trinity Creek			300
McComb, Tangipahoa Creek			650
Oxford, Hodges's pond			100
West Point, Miller Lake			200
Titus's pond			150
Missouri:			
Ferguson, Club Lake			150
Marceline, Santa Fe Club Lake			150
Montana:			
Glendive, Yellowstone River			500
New Jersey:			
Hackettstown, State fish commission	8,000,000		
Mountain Lake, Mountain Lake		500,000	
Wildwood Lake		500,000	
Sussex, Lake Pochunk		500,000	

Details of Distribution of Fish and Eggs, Fiscal Year 1915—Continued.

YELLOW PERCH—Continued.

Disposition.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New Mexico:			
Artesia, Clark's lake			200
Carlsbad, Pecos River			100
Las Vegas, Asylum Lake			70
Santa Rosa, Hidden Lake			46
Lake de Agua Negra			47
Swan Lake			47
New York:			
Addison, Canisteo River			300
New York City, New York Aquarium	1,000,000		
North Carolina:			
Overhills, Overhills Lake			250
Taylorsville, Adams's pond			50
Ohio:			
Lima, McBeth Lake			200
Ravenna, Muzzie Lake			500
Pennsylvania:			
Altoona, Ant Hill Pond			150
Beech Creek, Bald Eagle Creek			250
Beech Creek			250
Denver, Heff's pond		200,000	
Muddy Creek		400,000	
Frankstown, Juniata River, Frankstown Branch		500,000	
Johnstown, Quemahoning Lake		400,000	
Kinport, Stiffles Run			100
Lansdale, Spring Lakes		100,000	
Rockmere, Alleghany River			150
Rowland, Lake Teedyuscung			200
Wescolang Lake			200
Susquehanna, Quaker Lake		600,000	
Silver Lake		600,000	
Telford, Perkiomen Creek, branches of		500,000	
South Carolina:			
Columbia, Hillcrest Lake			150
Greenville, Piney Mountain Lake			100
South Dakota:			
Murdo, Murdo Dam			100
Tennessee:			
Cedar Hill, Red River, Sulphur Fork			150
St. Bethlehem, Red River, West Fork			225
Vermont:			
Boltonville, Tickleneck Pond			1,000
Hydeville, Lake Bomoseen			280
Middlebury, Otter River			500
North Ferrisburg, Cedar Lake		500,000	
Richford, Missisquoi River		1,000,000	
St. Johnsbury, Chandler Pond			2,000
Joes Pond			13,200
Wells River, Wells River			2,500
Virginia:			
Alberta, Wayqua Creek Pond			150
Bryans Point, Dogue Creek		6,997,000	
Little Hunting Creek, Little Hunting Creek		26,252,000	
Mount Vernon, Potomac River		12,199,000	
Pohick Creek, Pohick Creek		12,917,000	
West Virginia:			
Clarksburg, West Fork River			600
Shinnston, Bingamon Creek			150
Wisconsin:			
La Crosse, Rice Lake			200
Total	19,000,000	195,267,000	104,287

STRIPED BASS.

Disposition.	Fry.
North Carolina:	
Weldon, Roanoke River	8,594,500

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

WHITE PERCH.

Disposition.	Eggs.	Fry.
Connecticut:		
Bethel, Chestnut Ridge Pond		200,000
New Canaan, Lake Sisrovit		200,000
Maine:		
Brooks, Passagassawaukeag Lake		400,000
Randall Lake		800,000
Norway, Lake Kewayden		300,000
Virginia Lake		900,000
Wescott, Little Ossipee Lake		600,000
Maryland:		
Battery, Chesapeake Bay		128,980,000
Havre de Grace, North East River		10,000,000
Queenstown, Queenstown Creek		400,000
Romney Creek, Romney Creek		600,000
Swan Creek, Swan Creek		3,000,000
Massachusetts:		
Clinton, Wanshacum Lake		400,000
West Pond		400,000
Danvers Junction, Cleary's pond		200,000
Gloucester, Mill Pond		400,000
Groton, Knopps Pond		600,000
New Bedford, Noquoxhoke Lake		400,000
Newtonville, Bullough's pond		200,000
North Grafton, Goddard Pond		200,000
Palmer, Forest Lake		200,000
State fish commission	13,000,000	
South Chelmsford, Baptist Pond		600,000
Still River, Barre Hill Pond		400,000
New Hampshire:		
Bristol, Newfound Lake		1,600,000
Canobie Lake, Corbett Pond		400,000
Concord, Contoocook River		200,000
Meredith, Lake Winnepesaukee		500,000
Weirs, Lake Winnepesaukee		500,000
New Jersey:		
Andover Junction, Coliffs Lake		400,000
Hackettstown, State fish commission	4,850,000	
Middletown, Hosford's pond		200,000
Mount Tabor, Mount Tabor Lake		400,000
New York:		
Altamont, Thompson Lake		300,000
Banksville, Lake Waccabuc		400,000
Trinity Lake		400,000
Newburgh, Orange Lake		400,000
North Carolina:		
Edenton, Albemarle Sound		4,500,000
Lake Toxaway, Lake Toxaway		800,000
Rhode Island:		
Woonsocket, Sneechconnett Pond		200,000
Vermont:		
Lakeside, Groton Pond		400,000
Total	17,850,000	161,980,000

WHITE BASS.

Disposition.	Fingerlings.
Iowa:	
Bellevue, Mississippi River	1,325
Minnesota:	
Homer, Mississippi River	1,500
Total	2,825

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

YELLOW BASS.

Disposition.	Fingerlings and adults.
Iowa:	
Manchester, Maquoketa River	25
Illinois:	
Meredosia, Meredosia Bay	15
Kentucky:	
Winchester, Wheeler Lake	380
Total	420

COD.

Disposition.	Fry.	Disposition.	Fry.
Maine:		Massachusetts—Continued.	
Boothbay Harbor, Boothbay Harbor	13,992,000	Gloucester, Atlantic Ocean	23,080,000
Linekins Bay	1,190,000	Ipswich Bay	3,530,000
Bristol, Atlantic Ocean	1,860,000	Gosnold, Buzzards Bay	17,569,000
Johns Bay	1,528,000	Vineyard Sound	86,579,000
Phippsburg, Casco Bay	3,271,000	Marblehead, Massachusetts Bay	5,870,000
Massachusetts:		Rockport, Atlantic Ocean	14,700,000
Barnstable, Vineyard Sound	3,553,000	Ipswich Bay	19,830,000
Beverly, Massachusetts Bay	3,270,000	Tisbury, Nantucket Sound	4,340,000
Cottage City, Nantucket Sound	13,408,000	Woods Hole, Eel Pond	2,693,000
Edgartown, Nantucket Sound	3,282,000		
Falmouth, Nantucket Sound	9,495,000	Total	260,133,000
Vineyard Sound	27,093,000		

POLLOCK.

Massachusetts:		Massachusetts—Continued.	
Beverly, Massachusetts Bay	67,710,000	Marblehead, Massachusetts Bay	67,350,000
Gloucester, Atlantic Ocean	160,850,000	Rockport, Atlantic Ocean	113,480,000
Ipswich Bay	16,100,000	Ipswich Bay	47,390,000
Massachusetts Bay	7,740,000		
Manchester, Massachusetts Bay	20,110,000	Total	500,730,000

MACKEREL.

Massachusetts:		Massachusetts—Continued.	
Falmouth, Vineyard Sound	2,899,000	Woods Hole, Great Harbor	1,658,000
Gosnold, Vineyard Sound	120,000		
Manchester, Massachusetts Bay	170,000	Total	4,847,000

HADDOCK.

Maine:		Massachusetts—Continued.	
Boothbay Harbor, Boothbay Harbor	974,000	Marblehead, Massachusetts Bay	4,580,000
Massachusetts:		Rockport, Ipswich Bay	3,950,000
Beverly, Massachusetts Bay	970,000		
Gloucester, Atlantic Ocean	13,080,000	Total	26,814,000
Ipswich Bay	3,260,000		

DETAILS OF DISTRIBUTION OF FISH AND EGGS, FISCAL YEAR 1915—Continued.

FLATFISH.

Disposition.	Fry.	Disposition.	Fry.
Maine:		Massachusetts—Continued.	
Boothbay, Sheepscot River	41,552,000	Gosnold, Buzzards Bay	20,378,000
Boothbay Harbor, Boothbay Harbor	210,954,000	Hadley Harbor	29,002,000
Townsend Gut	14,968,000	Vineyard Sound	67,750,000
East Boothbay, Linekins Bay	75,464,000	Manchester, Massachusetts Bay	9,900,000
Southport, Ebencook Harbor	6,188,000	Provincetown, Provincetown Harbor	28,000,000
Townsend Gut	45,373,000	Quissett, Quissett Harbor	34,743,000
Massachusetts:		Tisbury, Nantucket Sound	23,826,000
Beverly, Massachusetts Bay	5,000,000	Waquoit, Waquoit Harbor	33,619,000
Cottage City, Nantucket Sound	38,751,000	Woods Hole, Eel Pond	13,000,000
Edgartown, Nantucket Sound	28,859,000	Great Harbor	152,464,000
Falmouth, Deacons Pond Harbor	15,154,000	Little Harbor	36,896,000
Nantucket Sound	176,235,000	Rhode Island:	
Vineyard Sound	9,890,000	Wickford, Wickford Harbor	70,000,000
Gloucester, Annisquam River	5,000,000		
Gloucester Harbor	89,080,000	Total	1,294,156,000
Ipswich Bay	12,110,000		

TAUTOG.

Disposition.	Fry.
Massachusetts:	
Woods Hole, Great Harbor	285,000
Vineyard Sound	321,000
Total	606,000

LOBSTER.

Disposition.	Fry.	Disposition.	Fry.
Maine:		Maine—Continued.	
Bass Harbor, Blue Hill Bay	3,000,000	Rogue Bluff, Pond Cove	5,000,000
Biddeford, Wood Island Harbor	2,000,000	St. Chebeague, Chandlers Bay	3,000,000
Boothbay Harbor, Boothbay Harbor	10,800,000	Sebasco, Casco Bay	3,000,000
Linekins Bay	2,000,000	South Hancock, Eastern Bay	14,000,000
Bristol, New Harbor	5,000,000	Southport, Cape Newagon Harbor	3,000,000
Bucks Harbor, Starboard Creek Harbor	2,500,000	Ebencook Harbor	3,000,000
Cape Porpoise, Cape Porpoise Harbor	3,000,000	Pig Cove	1,000,000
Cranberry Isle, Frenchmans Bay	3,000,000	South Thomaston, Owls Head Bay	500,000
Cushing, Pleasant Point Gut	6,000,000	Stockton Springs, Stockton Springs Bay	3,000,000
Eastport, Eastport Harbor	5,000,000	Stonington, Deer Island Harbor	2,000,000
Falmouth, Casco Bay	4,000,000	Swan Island, Penobscot Bay	5,500,000
Friendship, Friendship Bay	6,000,000	Thomaston, Seal Harbor	4,000,000
Georgetown, Fire Island Harbor	2,000,000	Vinehaven, Vinehaven Harbor	20,000,000
Gouldsborough, Dyers Bay	7,000,000	York Harbor, York Harbor	4,000,000
Prospect Harbor	3,000,000	Massachusetts:	
Jonesport, Cape Split Harbor	2,500,000	Gloucester, Atlantic Ocean	300,000
Kennebunk Point, Kennebunk Harbor	3,000,000	Ipswich Bay	270,000
Kittery, Pepperell Cove	5,000,000	Manchester, Massachusetts Bay	300,000
North Haven, North Haven Thoroughfare	2,000,000	New Hampshire:	
Penobscot Bay	1,000,000	Little Harbor, Little Harbor	4,000,000
Ogunquit, Perkins Cove	2,000,000	Portsmouth, Portsmouth Harbor	3,500,000
Phippsburg, Casco Bay	4,000,000	New Jersey:	
Portland, Peaks Island Roads	3,000,000	Cape May, Atlantic Ocean	[a] 175
Portland Harbor	4,000,000	Washington:	
Robbinston, St. Croix River	500,000	Anacortes, Anacortes Harbor	[a] 1,604
Rockland, Rockland Bay	14,000,000	Deer Harbor	[a] 1,900
Rockport, Rockport Harbor	10,000,000	Japan:	
		Applicant	[a] 100
		Total [b]	194,673,779

[a] Adults.

[b] Lost in transit, 2,421 adults.

FRESH-WATER MUSSEL PROPAGATION.

The propagation of fresh-water pearl mussels is pursued in connection with the Fairport, Iowa, Biological Station, with field parties working in several places in the Mississippi Basin.

A steady increase in the number of mussels distributed has marked the progress of the work since the beginning of the practical operations five years ago. During the fiscal year 1915, 344,655,260 glochidia, or larval mussels, were planted in the public waters, representing an increase of about 50 per cent over the output of the preceding year.

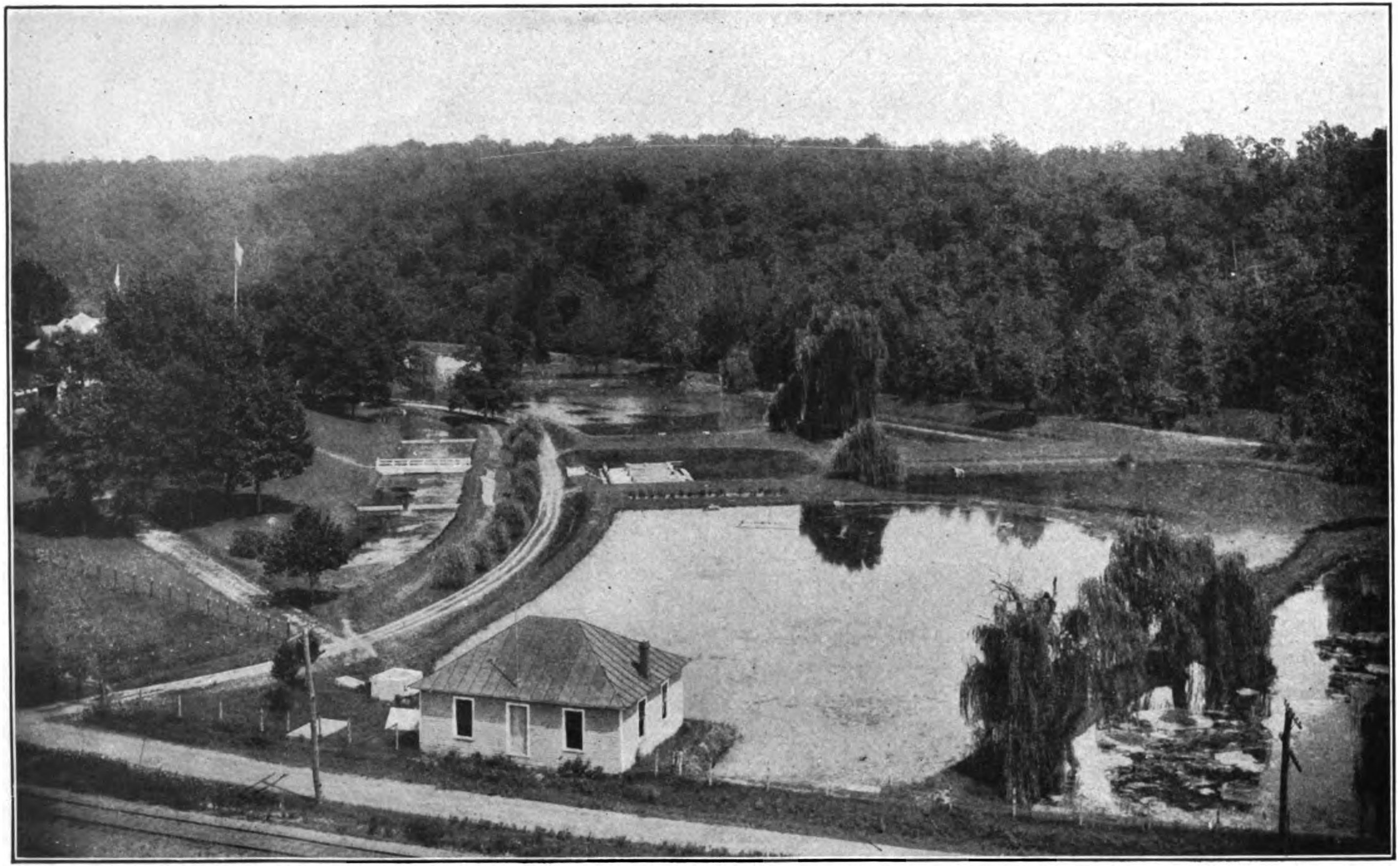
Incidental to these operations 207,919 fish were used, of which 47,733 fishes were rescued from landlocked ponds in the overflowed lands and returned to the rivers. More than two-thirds of the fishes rescued in these operations were adult food fishes.

The following table gives the number of each species of mussel planted, and the locality in which the fish infected with them were planted:

MUSSEL PROPAGATION, FISCAL YEAR ENDING JUNE 30, 1915.

Points of deposit and species of glochidia used for infection.

Species.	Mississippi River, Fairport, Iowa.	Lake Pepin, Minn.	Wabash River, Vincennes, Ind.	Black River, Black Rock, Ark., and south.	White River, Newport, Ark., and vicinity.	Total.
Pocketbook (*Lampsilis ventricosa*)	6,206,300	2,701,700	....	....	....	8,908,000
Mucket (*Lampsilis ligamentina*)	111,643,100	....	9,475,000	26,175,500	25,333,300	172,626,900
Lake Pepin mucket (*Lampsilis luteola*)	1,062,000	137,194,400	....	....	....	138,256,400
Black sand-shell (*Lampsilis recta*)	17,255,900	....	....	....	....	17,255,900
Yellow sand-shell (*Lampsilis anodontoides*)	3,763,360	....	....	592,800	743,800	5,099,960
Butterfly (*Plagiola securis*)	2,436,600	....	....	....	....	2,436,600
Pimple-back (*Quadrula pustulosa*)	71,500	....	....	....	....	71,500
Total	142,438,760	139,896,100	9,475,000	26,768,300	26,077,100	344,655,260



POND FISH-CULTURAL STATION, MAMMOTH SPRING, ARK. (BUREAU OF FISHERIES.)

FISH PONDS ON FARMS

By ROBERT S. JOHNSON and
H. F. STAPLETON

Appendix II to the Report of the U. S. Commissioner
of Fisheries for 1915

1

CONTENTS.

Page.

Introduction........ 5
Value of fish as food........ 5
Utilization of waste lands........ 6
Water supply—volume, quality, and temperature........ 7
Sources of water supply for ponds........ 8
Desirable sites for the location of ponds........ 11
Pond construction........ 12
Aquatic plants and their value in pond-fish culture........ 15
Species of fishes suitable for pond culture:
    Smallmouth black bass........ 16
    Largemouth black bass........ 17
    Crappie........ 17
    Calico bass........ 17
    Rock bass........ 18
    Warmouth bass........ 18
    Sunfish........ 18
    Catfish........ 18
Natural and artificial fish foods........ 19
Diseases........ 20
Stocking ponds with brood fish........ 20
Spawning season........ 22
Spawning habits........ 23
Characteristics of the young fish—their food and growth........ 24
Capacity of a pond for the production of fish........ 25
Enemies........ 26
Methods employed by the Bureau of Fisheries in the distribution of fish........ 26
Removing fish from a pond........ 28

FISH PONDS ON FARMS.

By Robert S. Johnson and M. F. Stapleton.

INTRODUCTION.

The propagation of fish on farms in artificially constructed ponds or in natural ponds of limited area is perfectly feasible; and with proper management such ponds will afford a convenient and economical food supply that will justify the expense of their construction or preparation and maintenance.

It is the purpose of this report to point out briefly the essential features to be considered in the location of a site, the construction of the pond and its operation, and the care of the fish contained therein.

This information has reference exclusively to the rearing of the spiny-rayed or warm-water fishes, which are especially adapted to culture in ponds, and which can only be propagated through natural reproduction.

Data regarding the trouts and other species of the Salmonidæ which can be propagated artifically are contained in another publication of the Bureau of Fisheries, which will be furnished on request.[a]

Federal and State Government have in the past decade done much to improve the conditions of rural life by the development of public resources, the advancement of social intercourse, the dissemination of agricultural knowledge, and demonstrations of a better domestic practice. Up to the present time, however, but little attention has been given to fish culture as an adjunct to farming.

VALUE OF FISH AS FOOD.

Mental and physical efficiency, in the last analysis, are dependent upon the character of the food supply, and fish may well constitute a needed ingredient which is usually missing from the farm dietary.

The requirement of variety in food is unquestioned, if indeterminate, and the palatability of fish to the average person, in conjunction with its value in protein content, makes it a pleasing and beneficial addition to the daily regimen.

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[a] Artificial Propagation of the Atlantic Salmon, Rainbow Trout, and Brook Trout. Bureau of Fisheries, Document No. 846.

The chemically complex substance known as protein is an essential constituent of food, the most important tissues of the body, other than the skeleton, being principally composed of it. Most human beings derive their needed protein from the flesh of animals, and in practically all civilized communities the greater part of it is supplied by meat and poultry. In the United States the main dependence in the past has been on meat—beef, mutton, and pork—which, owing to the large areas available for grazing and the low price of corn, could be raised in quantities great in proportion to the population.

These conditions no longer prevail, and shortage of the meat supply, with resulting high prices, is now a general condition. As a substitute for meat fish offer many advantages. Pound for pound it contains as much protein as meat, and in some cases more. It therefore affords the same class and grade of food material as beef, mutton, and pork.

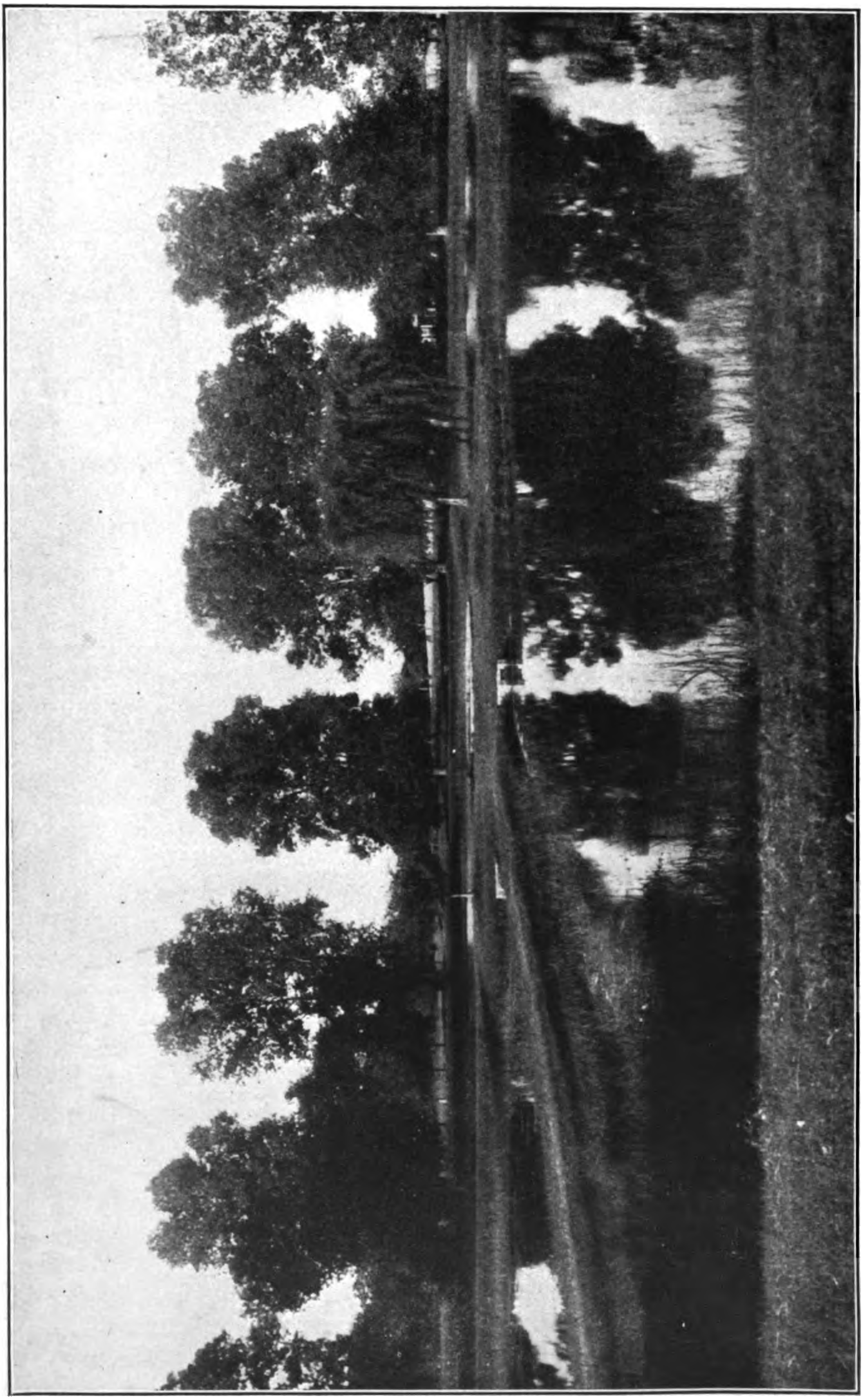
Unfortunately, those actively engaged in farm work rarely have the opportunity to fish in neighboring lakes and streams, and more distant excursions, involving several days' absence from home, are usually beyond consideration. The need is apparent, therefore, for a readily accessible supply of fresh fish that may be drawn upon when desired—a source as dependable as the smokehouse or the poultry yard.

UTILIZATION OF WASTE LANDS.

The Bureau aims especially to influence the utilization of the natural and favorable water areas existing on countless farms which at the present time are being put to no use, many of them constituting unsightly waste spaces that detract from the value of the land. The presence of springs, lakes, flowing wells, or adjacent streams are all leading incentives to a fishery project, and suitable sites for the construction of ponds, especially if at present unremunerative, should make their use to such a purpose desirable to the thrifty husbandman after a full comprehension of their possibilities in a fish-cultural way.

Ponds intended primarily for the cultivation of fish may be conveniently located for the watering of stock, or the overflow therefrom may be utilized for the irrigation of land. In many sections of the United States artificial ponds on farms are an absolute necessity to serve one or both these latter purposes, and by a merely nominal expenditure such water areas may be advantageously utilized for the growing of fish without interfering in any way with the original uses for which they were intended.

At the outset the main object of the amateur farmer fish-culturist should be the production of a food supply for home consumption



BASS AND CRAPPIE PONDS SHOWING DRAINS AND CROSS SECTION EMBANKMENT. SAN MARCOS, STATION, TEXAS. (BUREAU OF FISHERIES.)

There are no authentic published records as to the financial returns that may be expected from the pursuit of pond fish culture on a commercial basis. Many theories have been advanced on this point, but, as in other undertakings of importance, the efficiency necessary in order to profitably conduct such a business can only be gained by repeated efforts and actual experience. Furthermore, in order to arrive at an estimate of any value one would have to take into consideration such important factors as the topographical features of the site, the character and quantity of the water supply available, the extent of the enterprise, and the location of the plant with reference to market and transportation facilities.

Taking all these facts into consideration, one can readily see the futility of attempting to forecast in a general treatise the financial returns that may be expected from any given pond area devoted to commercial fish culture.

All this, however, detracts in no way from the argument favoring the construction of ponds with the view to providing a food supply for private use. The feasibility of pond fish culture on this basis has been fully demonstrated, and ample quantities of fish for home use are to-day being propagated in established ponds on farms, proving the value of such an undertaking for that purpose alone.

After gaining the required experience and knowledge of the subject as a result of conducting work for several years on a limited scale, the farmer will be well qualified to judge as to the practicability of extending his operations, and can then, if he so chooses, increase his facilities with the view of raising fish for the market.

Frequent inquiries are received by the Bureau of Fisheries regarding the use of natural ponds, lakes, and streams, for the raising of fish. With respect to such water areas it may be stated that if drainage is provided for, the pond bed cleared of débris, the site protected against the inflow of surface water—if, in short, complete control is effected, natural water areas will possess many advantages over artificial constructions. There is objection, however, to any body of water not under complete control.

WATER SUPPLY—VOLUME, QUALITY, AND TEMPERATURE.

In a brood pond, a constant water level should be maintained at all times, especially during the breeding season. The required flow, which will vary with the character of the soil, must be sufficient to replace loss by evaporation and seepage. An amount just short of overflowing the pond is the ideal to be attained, as it is desirable to avoid a current. A surplus of water is preferable to a shortage, as any excess may be easily diverted through waste channels or held as an emergency reserve.

For a 1-acre pond, where the sides and bottom are of clay or rich loam, a flow of from 30 to 50 gallons per minute should be sufficient to maintain a proper water level at all times, while sandy or gravel soil untreated may require double that amount. A practical method of measuring the flow of water from any source is as follows:

Select a stretch on the stream or ditch affording as straight and uniform a course as possible. If the water at any point is carried in a flume, it will be better to measure at that point. Lay off a distance of, say from 10 to 50 feet; measure the width of flowing water at about six different places in this distance, and obtain its average width. Likewise at these same points measure the depth of water at three or four places across the stream and obtain its average depth. Then drop a float in the water and note the number of seconds it takes to traverse the given distance. The product obtained by multiplying the average width in feet by the average depth in feet by the velocity (expressed in number of feet per second) will give the flow of the stream in cubic feet per second. From the figures so obtained it is advisable to deduct about 20 per cent, as the surface velocity of water is in excess of the actual average velocity.

High temperatures in season are necessary in brood and rearing ponds. If the water is cold at the source, the fault must be corrected by reducing the inflow to the lowest quantity that will maintain a uniform level, thus allowing the maximum absorption of warmth from the sun and air. Water that does not fall below 60° F. in the brood pond during the spawning season is desirable.

SOURCES OF WATER SUPPLY FOR PONDS.

Springs are the most dependable of all the sources of water supply, requiring the minimum expenditure in preparation and being the least subject to outside influence. The presence of injurious mineral substances can usually be detected without expert analysis, but the amateur fish-culturist may be surprised to learn that so-called pure water often carries abnormal proportions of oxygen or nitrogen gases in quantities inimical to fish life. This may be due either to subaeration or superaeration, and the results following the use of such water will be as disastrous in the one case as in the other.

This contingency and the requisite of high temperature make precarious the embodiment of springs and wells within the pond bed. In the absence of thoroughly demonstrated fitness, the more prudent course will be to provide an independent water supply reservoir, apportioning its area to the volume of the spring. While being held in this reservoir the gaseous contents of the water will be corrected and its temperature seasonably modified.

The flow from many springs is so obstructed through the trampling of stock or from other causes that they emit only a small portion of the water available near the surface. In such cases the supply may usually be materially increased by sinking 2-foot lengths of terra-cotta pipe over the bubble and removing the incased earth. Several such pipes in a promising area will often result in an astonishing increase in flow. Where the cost is not prohibitive, however, the better course will be to excavate the site and wall it in with rock and concrete.

In profusely watered sections—notably, in the States bordering the Great Lakes—there are many tracts of marshy characteristics, some of them hundreds of acres in extent, promiscuously interlaced with tiny rivulets which combine to form streams of considerable size. Seemingly inexhaustible quantities of water lie close to the surface in many such places, and by driving pipes only a few feet into the ground flowing wells are obtained.

Where the volume of water is a matter of concern the overflow level of spring reservoirs, sunken tiling or driven pipes should be kept as low as possible, consistent with the object in view, as the flow will naturally decrease with the elevation of the head against which it works.

A brood pond contiguous to a spring reservoir may be fed through a spillway directly into the stock pond. Where a reservoir is impracticable, at least partial correction of any abnormal condition of the water may be brought about by conducting it to the pond through open ditches or raceways of wood or concrete, the choice of material being determined by adaptability of the soil and the comparative expenditure involved.

The chief objection to creek or river water as a supply for fish ponds is the great quantity of mud and débris carried during freshets, and the excessive cost of effective measures to prevent its introduction into the ponds. Streams subject to extremely high-water periods are totally impracticable as a source of supply, while those of lesser floods can be utilized only after a considerable initial expenditure, and much vigilance will be entailed in their use, as large and continuous deposits of mud in breeding ponds will ruin any eggs present, and invariably kill recently hatched fry. Furthermore, protracted roily water will retard and sometimes prevent growth of the aquatic vegetation so essential to pond fish-cultural operations. It is also imperative that undesirable and predaceous fishes be rigorously excluded from the ponds, and it will be impossible to accomplish this if the water supply is beyond control during certain periods.

From the foregoing it can readily be seen that if a stream is subject to appreciable changes, as a result of storms or drainage from local watersheds, it will be unwise to establish a pond therein by the construction of dams, as is often contemplated. It will be entirely feasible, however, to conduct water from such a stream to ponds adjacently located, provided the intake is adequately screened, the supply arranged so that it can be cut off during times of excessive turbidity, and measures are taken to prevent the inundation of the pond site in high-water periods.

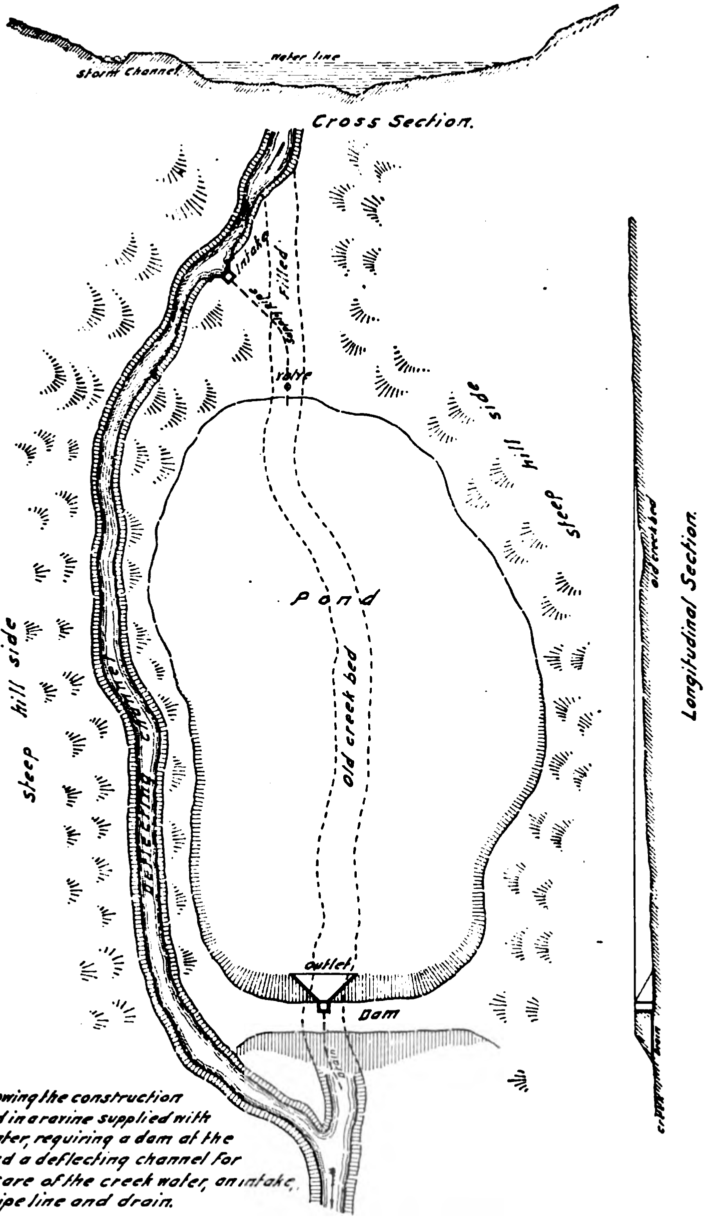
It may be necessary to erect a dam in the channel of the stream, to provide the required head of water for a gravity flow to the pond, in which case it may be of a simple type, designed merely to accomplish the end in view. The intake from the stream should be wide and deep, thus presenting a large screen surface to obviate the complete stoppage of the water supply in the absence of the caretaker. It should be covered by a series of screens graduated in size, the first to consist of coarse hog wire, or wooden racks with like openings, to catch the largest objects. The intermediate screen (of 2-inch mesh) will intercept vegetation, while the inner one must be fine enough to exclude smaller débris and the fry of undesirable fishes. Immediately below the screens, gates should be provided so that the water may be shut off at will and diverted into a storm channel when it becomes too roily for use.

Where the source of supply is a lake the difficulties referred to above are not encountered, lake water seldom being roily and demanding less attention to screens owing to absence of currents.

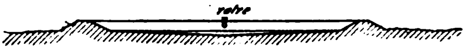
Uncontaminated open waters have many advantages. Their temperatures are seasonal; usually there are no abnormal gaseous constituents to be corrected; the plankton or pelagic animal and plant life contained therein forms a valuable addition to the natural food supply in the pond, and were it not for the difficulty of control and occasional roilyness, such waters would be preferable to springs and wells as a source of supply to fish ponds.

Wells, both flowing and power lifted, are successfully used in some sections for the cultivation of fish. Before incurring the expense of constructing ponds to be supplied from such a source, however, it will be advisable to thoroughly test the water in order to demonstrate its fitness for fish culture. This can best be done by fitting up a running-water supply in a retaining reservoir, and holding therein, for an extended period, a number of specimens of the species of fish it is desired to propagate. If they thrive, it may be assumed that the water is free from injurious gases or mineral substances and is adapted to the work it is proposed to undertake.

RAIN WATER (SURFACE DRAINAGE).—Another class of ponds available for the propagation of fish, known as "sky ponds," embraces those wholly or partly dependent upon local precipitation for their supply of water. Such ponds are invariably profuse in the production of fish food, and for this reason would be ideal were there an auxiliary water supply adequate to maintain constant surface levels during the critical nesting season, and a fair depth throughout the

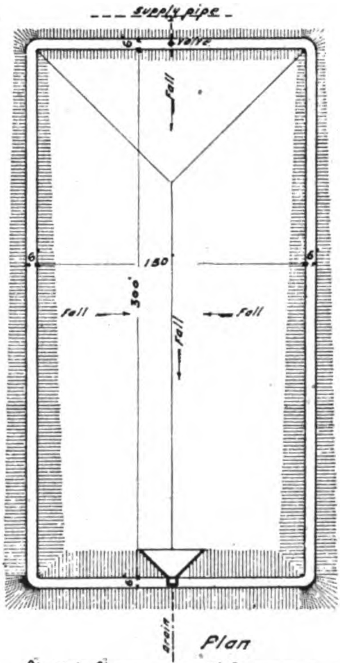


Plan showing the construction of a pond in a ravine supplied with creek water, requiring a dam at the lower end a deflecting channel for taking care of the creek water, an intake, outlet, pipe line and drain.

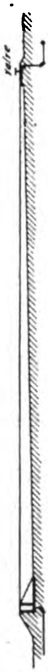


Cross Section.

Pond

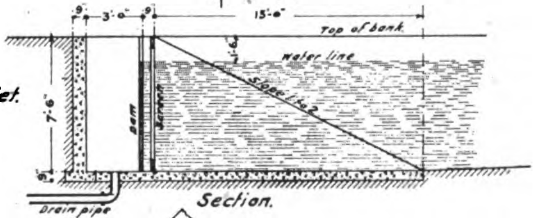


Plan

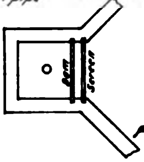


Longitudinal Section.

Pond Outlet.



Section.



Plan.

Plan showing the construction of pond on flat land supplied with spring water and requiring excavation, embankments, outlet, pipe line and drain.

remainder of the year. In the absence of this reserve many such ponds become practically dry during periods of drought or freeze to the bottom in the winter months. Where ponds are subjected to such conditions fish cultural operations are impracticable.

Ponds dependent entirely upon precipitation and surface drainage for their water supply must necessarily be located at a low elevation, in order that the surface drainage from surrounding lands may be taken advantage of. Land depressions, ravines protected from floods, or swamp lands, are desirable sites for such ponds.

Catfishes only can be recommended for the best of "sky ponds," strictly speaking, and the results even with them will be very uncertain.

DESIRABLE SITES FOR THE LOCATION OF PONDS.

If a gravity flow of water is contemplated, the fish pond must, of course, be located below the level of the source of supply. Porous soils are to be avoided, if possible, not only because of the large volume of water required to replace loss from seepage but because they are usually sterile. Swamp lands, old water courses, and catch basins of years' standing are the best and most productive soils, as they possess the required fertility and contain seeds and spores for the early development of profuse vegetation and animalcula. Ponds located in such soil will maintain their water levels with a minimum inflow.

Satisfaction may be had from ponds less favorably located, however, if good sense is employed in their preparation and maintenance. Aside from the ideal lands of alluvial deposits, clay loams are a first choice, being most nearly impervious to water and quickly responsive to efforts made to establish their fertility. Sandy loam, being the most prevalent, is probably the most general soil in use for pond construction. While some difficulty may at first be experienced in making it retain water, this is overcome in time by the accumulation of decayed vegetation. Its fertility is good and, in general, it produces a sufficient supply of natural food. Even clear sand and gravel mixtures may be made to hold water and brought to fair productivity by increased expenditures in construction, and by the application of fertilizers in a manner to be explained later.

It is very desirable, and also essential for a marked degree of success, that ponds be so located and constructed that they may be entirely emptied of water at certain seasons. To this end there should be accessible a natural dry run or water course lower than the bottom of the proposed pond, to which drain pipes may be conducted.

Ponds are drained for the purpose of assorting fish, removing objectionable species, reducing the stock, killing out excessive vegetation, etc. Complete drainage can not be effected, of course, unless there are adjacent waters to which the fish can be removed during this process. A number of small auxiliary ponds will always be found advantageous in fish-cultural work.

Where the primary purpose is other than fish culture the selection of the site must depend upon the more important object in view. Fish culture will yield very satisfactory returns as a secondary enterprise, but the site selected for the work should by all means be the best available consistent with the general scheme of farming operations.

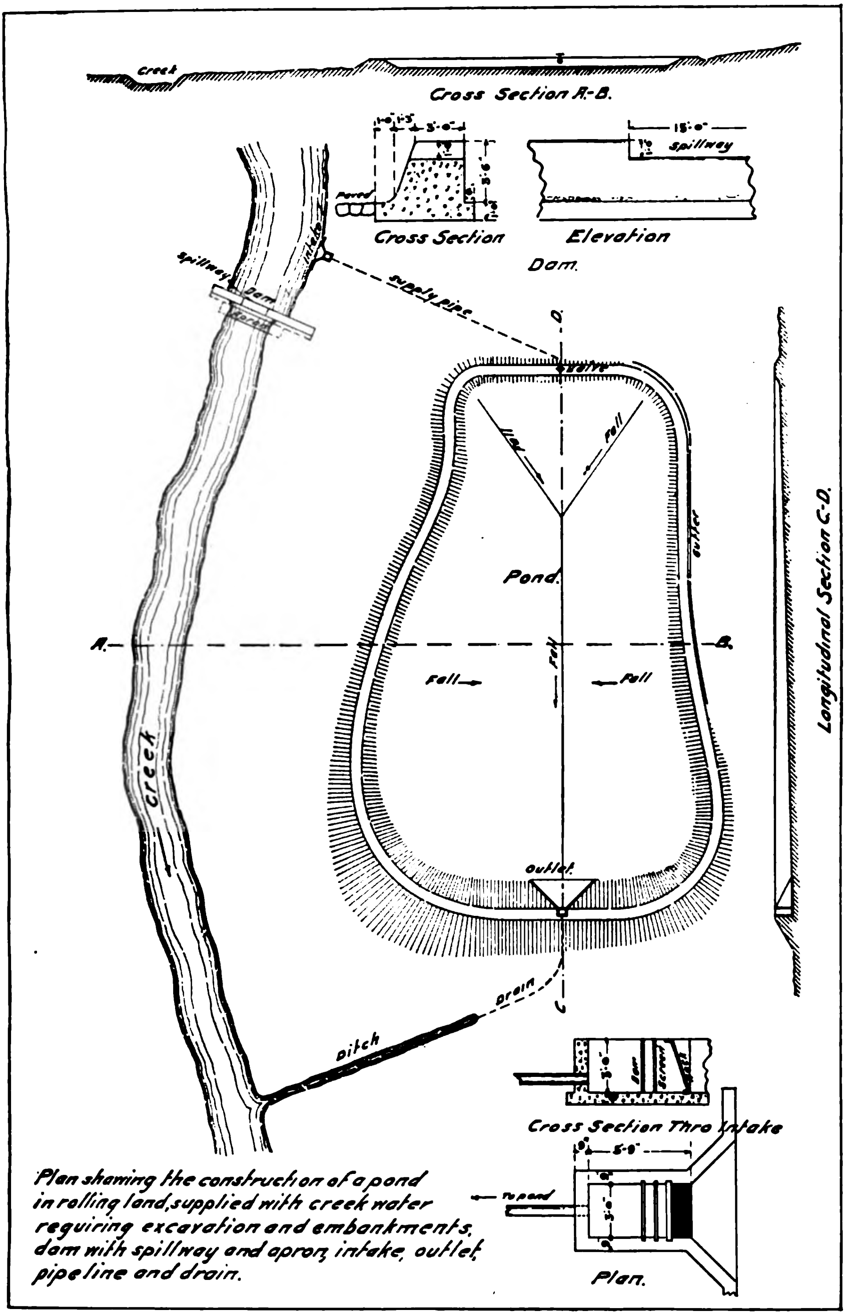
POND CONSTRUCTION.

The exact mode of construction must depend largely upon local conditions, such as the presence or absence of favorable land contour, the nature of the soil, proximity to storm channels, and the area of the ground to be worked. Even with these features specified lesser local characteristics and the exigencies of individual circumstances will vary the application of any approved general method. Where practicable ponds should be not less than 1 acre in surface area. Those of smaller extent will produce fish and add an interesting feature to farm life, but they will not yield adult food fishes of the larger species in quantities sufficient for the requirement of the average farmer's table.

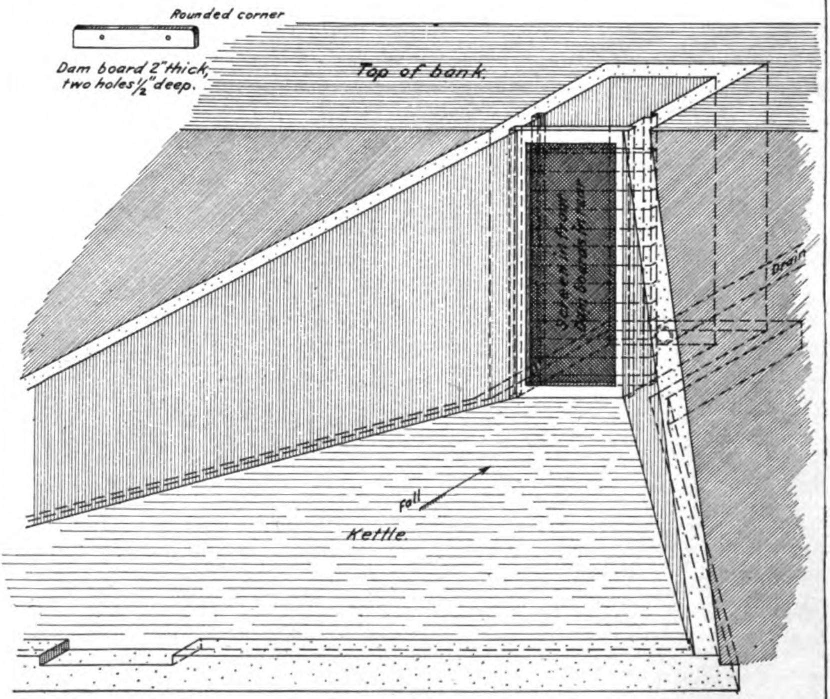
Natural draws or ravines involve the least expenditure in their adaptation to fish ponds, as two and frequently three sides are already formed, so that an earthen embankment connecting them will complete the inclosure. Such locations must be surrounded by ditches to divert surface water where that is likely to roil the pond, and effective waste channels should be provided if the site covers the natural course of flood waters.

If flat land of an elevation only slightly lower than that of the source of water supply is selected, it will be necessary to excavate the ponds in whole or in part to the required depth to insure a water level lower than the supply. Thus the excavations will form solid banks which, if impervious to water and properly sloped, will require no further attention except to bring them to uniform widths and elevation, which can be done with the material excavated in forming the pond proper. The bottom of the pond should be shaped to drain to a central point.

On swamp lands and depressions which are susceptible to drainage and are at the same time low enough to insure a gravity flow of water from the source of supply, one or more fish ponds can be constructed by the erection of longitudinal and cross-section dikes high enough to provide the required depth of water. The construction of such ponds involves only sufficient excavating to give the bottom the proper slope. In other words, the pond should be built up rather than



Plan showing the construction of a pond in rolling land, supplied with creek water requiring excavation and embankments, dam with spillway and apron, intake, outlet, pipe line and drain.



Pond Outlet of Cement.

Outlet made of wood is similar in construction to that of concrete, requiring driven posts under same to secure it and suitable cleats to hold screen and dam boards.

excavated, and the water level therein will be higher than the surrounding land.

The method of constructing pond embankments is governed by the topography of the land, the character of the soil, and the volume and pressure of the water to be confined. All made embankments should be at least 6 feet wide at the top, and the sides sloped not less than 2 feet to each foot in height. For instance, a 6-foot fill should be 30 feet wide at the base and 6 feet at the top.

Prepare the foundation by plowing the site of the embankment, after first removing all trees, underbrush, rock and sod, and, as an extra precaution against seepage, dig a trench 12 inches deep along the median line. This will form a break, or set-off, between the original ground and the made construction, which is a point of natural weakness. The filling should progress by layers over the full width and length of the levee as a continuous operation rather than by sections; otherwise the completed work will later develop checks by reason of variations in material and compactness. Rocks are of use as a protecting riprap on the slopes after completion.

In case the water supply to a pond is taken from a creek, the latter must be dammed and an intake built above the construction provided with screen and dam boards, from which a water conduit must be laid to the pond. The dam should be provided with an ample spillway, which may best be constructed of concrete.

The shape or outline of the pond is immaterial. Currents of water are undesirable in the propagation of the spiny-rayed fishes. In fact, the best brood and rearing ponds are those which are supplied by backwater from other bodies, and if there is reasonable depth and a fair growth of vegetation no stagnation will result.

Success in pond fish culture is being attained with widely varying forms of construction. To a considerable extent fish will adapt themselves to existing physical conditions. In nature they seek comparatively shoal waters in which to spawn, by reason of the prevailing higher temperatures, and during certain stages of their growth the young choose similar depths, where food is plentiful and beyond the bounds of the customary range of large fish. Relatively deep waters must be accessible to the stock fish during winter months, and what this depth shall be will depend largely upon the latitude of the location; cold climates where great thickness of ice forms require the deepest pools.

Experience teaches that breeding ponds should be excavated to hold not less than 12 inches of water at or near the margins; that one-fourth of the pond area should range from 12 to 30 inches in depth; and that one-half its total area should be not over 3 feet deep, the bottom of the remainder to slope from this depth to 6 feet or more at the outlet. Avoid abrupt slopes. Provide complete drainage to the deepest point, where a waste pipe controlled by gates or slash boards should lead to outside natural channels.

It will be found a great convenience when draining ponds to have shallow channels 6 inches deep and 15 inches wide, at the head of the drainpipe, radiating to all parts of the pond bottom from a kettle or pit, which may be of wood or concrete. A large percentage of the fish will follow such channels as the water recedes, and may be removed from the kettle with less danger of injury than if picked up promiscuously about the pond.

Remove all projections from the pond bottom which might interfere with the operations of seines, plow the entire bed and level it with harrows before turning in the water or treating further for water-tightness.

As stated above, ponds located on swamp bottoms or in clay soils are practically impervious to seepage, and there should be no difficulty in maintaining their surface levels. Sandy loams are more uncertain; they require time to become thoroughly saturated, but will improve in this respect from year to year, through the accumulating deposits of decaying vegetation. It is an excellent practice when first filling newly-constructed ponds with water, whatever the nature of the soil, to follow the advancing water line with a drag or harrow, driving the team knee-deep into the water. The constant roiling and puddling of the ground in this manner is very effective in cementing open cracks and crevices. Very porous soils may require the addition of a layer of clay before they will hold water. From 2 to 6 inches of stiff brick clay over the entire bottom and up the sides, well above the water line, the bottom harrowed down as explained above, will hold water over the most open ground likely to be used. The only objection to the presence of clay is its general sterility, but this may be corrected by another layer of rich loam, after the clay has been worked down and proved efficacious. Where this process is to be employed, allowance must be made at the time of excavation for the refill of 12 or more inches. Coarse stable manure, and even clean straw, well trampled into the pond bottom, has been reported as a successful remedy for seepage.

A good set of native sod or sedge grass around the entire pond at the water line is the best preventive of wave washing and encroachments upon new fills. If the location is such that strong currents or eddies are present, piling, rock riprap, or other reinforcement, will be necessary at the points of greatest exposure.

Landowners desiring to undertake fish propagation may feel that the expenditure necessary to secure completed ponds, as described above, is prohibitive; or they may have waters available for fish culture which it would not be expedient to remodel along the lines indicated. The plans outlined are in accordance with the present-

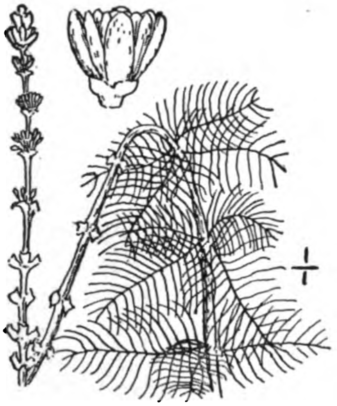


FIG. 1.—Spiked water milfoil (*Myriophyllum spicatum*). Found in deep water. Newfoundland to Manitoba and the Northwest Territory, south to Florida, Iowa, Utah, and California. Commonly known as foxtail. Suited to southern ponds of high temperature, and unlike most species will thrive in comparatively soft waters. "Parrot-feather," and introduced species of *Myriophyllum* will make better growth in sterile ground than the foxtail: otherwise the two have similar characteristics.

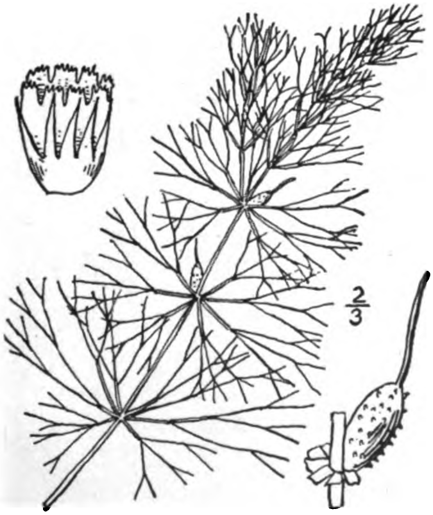


FIG. 2.—Hornwort (*Ceratophyllum demersum*). Found in ponds and slow streams throughout North America, except extreme north. This plant is shallow-rooted, deriving most of its sustenance from the water. Will thrive in cold spring water.

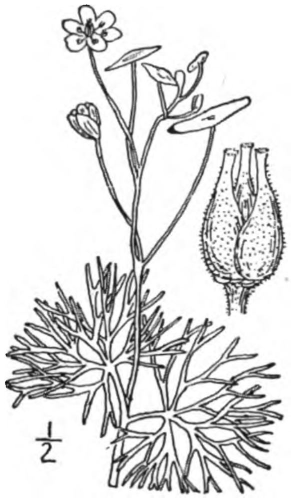


FIG. 3. — Fanwort (*Cabomba caroliniana*). Found in ponds and slow streams, southern Illinois to North Carolina, south to Florida and Texas. Characteristics similar to Ceratophyllum.

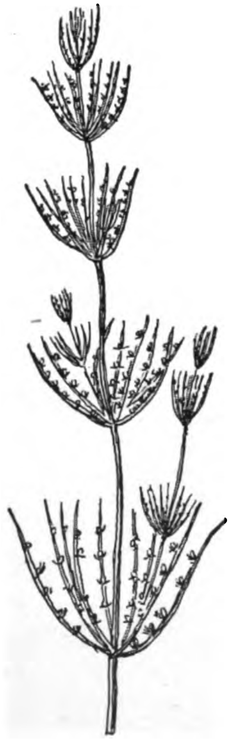
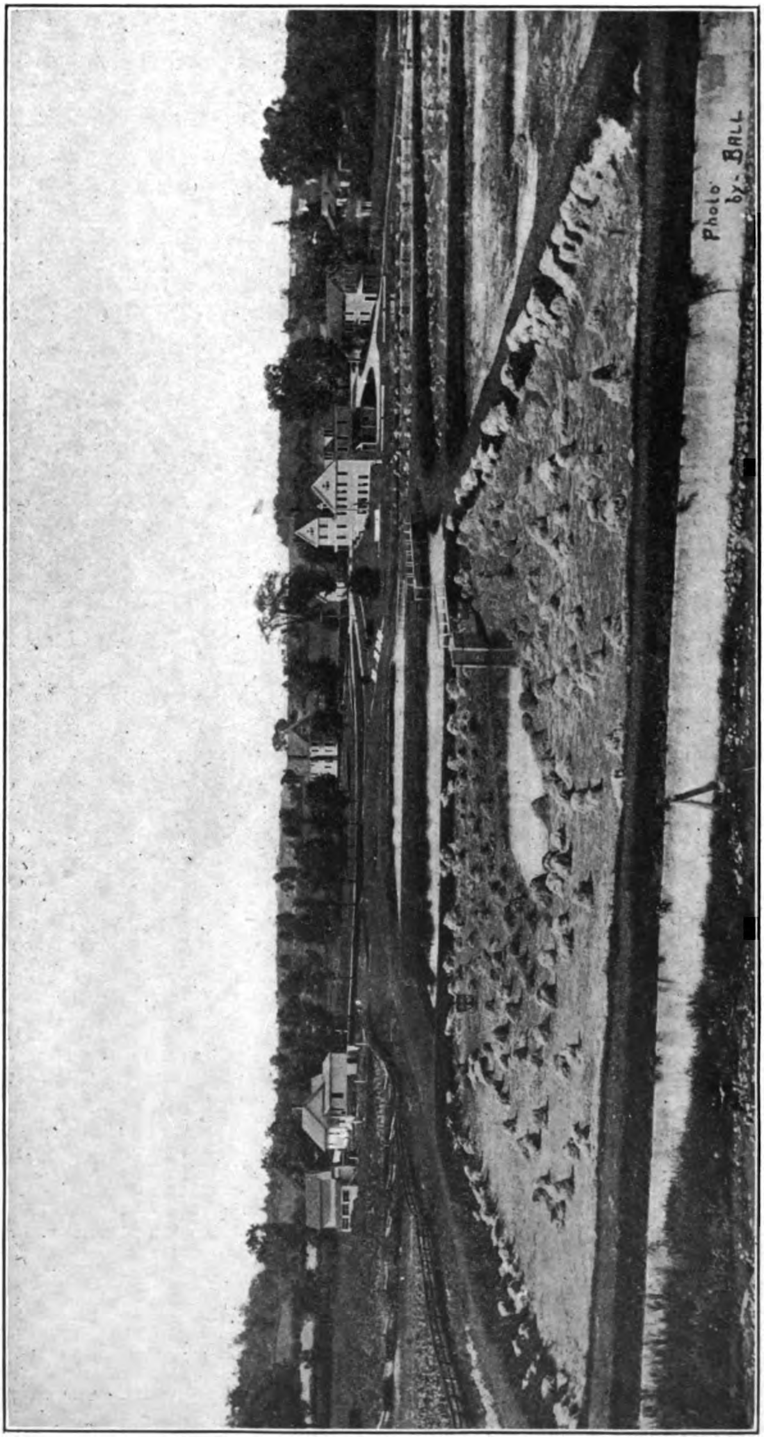


FIG. 4.—*Chara fragilis*. A common form of chara. There are many varieties of this species and all are classed very high as food producers and oxygenators. Grows profusely in all limestone waters throughout the United States,



PONDS AT NORTHVILLE, MICH., STATION AFTER WATER HAS BEEN DRAWN OFF AND THE CHARA RAKED INTO PILES.

day standards. Fish may and are being successfully propagated in far less ideal environments, but more native ingenuity in such cases is required. This, however, is a common attribute of the American farmer, and any one who can mix balanced feeds, practice scientific grain breeding, or master the intricacies of modern farm machinery, need not hesitate for fear of failure to add fish culture to his daily routine.

Summarizing the construction, these features should be provided for:

1. Water-tightness, so that a small inflow will be sufficient. This will result in high temperatures during the summer months.
2. A shallow area, from 18 to 30 inches deep, where the fish may nest.
3. A deeper area, of 6 feet or more, for winter quarters. This will also be occupied by the adults in the summer, after nesting is completed.
4. A fertile bottom for the growth of aquatic plants, upon which fish food depends.

If these requisites, together with a suitable water supply, are provided the fish will thrive.

The accompanying drawings explain the types of intake and drainage devices which have proved effective. These may be varied to meet the conditions encountered, and be constructed of either wood or concrete. The latter material is shown in the illustrations, and is the most durable, but wood will be equally as satisfactory while it lasts.

AQUATIC PLANTS AND THEIR VALUE IN POND-FISH CULTURE.

Frequent reference has been made to the necessity of vegetation in fish ponds. Its advantages are many. It serves as food and a harbor for the lowest forms of minute animal life. Each advance in the scale of life constitutes a food for higher forms, and in the guise of fish the fertility of the ground contributes to the food of the human race.

Plants play an important part in the purification of water, taking up the carbonic acid gas liberated by decomposition and exhaling the oxygen essential to living creatures. They thus prevent the asphyxiation of fish life, and act as a corrective of many abnormal characteristics of individual waters.

Losses of fish through the depredations of enemies will be greatly lessened where there is an abundant aquatic growth in which they may hide. It furnishes a grateful shade on bright warm days, and the interlacing roots so bind the bottom soil as to prevent turbidity from casual disturbances.

The aquatic flora of a locality varies greatly with its latitude and is also governed by the chemical ingredients of specific waters. The most desirable species usually thrive best in waters of limestone origin. Plants of filamentous character are preferable to the large regular-leaved kinds, as they present greater surface expanse for the exchange of gases, and, on account of their shallow rootage, are more readily controlled by the fish-culturist. Pond lilies, cat's-tail, and coarse water grasses or weeds in moderation are beneficial, as they afford shade and shelter. However, they are lower forms of oxygenators than the plants of finer growth, and they make seining operations more difficult; and it is practically impossible to eradicate them after they have obtained a foothold.

All species herein described which are indigenous to the waters of the locality in question may be advantageously utilized in pond-fish culture. Undoubtedly one or two of the introduced species will eventually drive out the others, but those remaining will be the ones best adapted to the environment. All of these will grow from cuttings, making it unnecessary to transplant the roots. The plants may simply be raked or pulled out of the open waters and pressed by handfuls into the soft earth in the shallow sections of the new pond, in spaces about 5 feet apart. The bottom must be covered with 6 to 12 inches of water during the operation, otherwise the sun and air will soon ruin the sets. In deep water the plants may be started by attaching a weight and sinking them to the bottom of the pond.

Much time and trouble are often required to bring about a profuse growth of aquatic vegetation,* but after a pond is thoroughly stocked even more labor is required to keep it within bounds. Ponds may become literally choked with water mosses, resulting in inconvenience to the owner and a detriment to the fish. They will roll the seines, snag the lines, and smother the fish when an attempt is made to draw down the water. It will usually be necessary to thin the moss out once or twice in the course of a summer, and all growth should be removed when draining the pond. An efficient method of removal is by raking, the worker standing on the embankment and throwing the moss out on land, or wading into the shallow water of the pond drawing it from a circle about him and building cocks of it. The deeper waters will have to be worked from a boat or raft.

SPECIES OF FISHES SUITABLE FOR POND CULTURE.

SMALLMOUTH BLACK BASS (*Micropterus dolomieu*).—Indigenous to lakes, rivers, and smaller streams from Lake Champlain to Manitoba and south to North Carolina and Arkansas. It seeks by preference the clear cool waters of its range, and in the Southern States is confined to the more rapid streams. The maximum weight is about 5 pounds, and the average weight from 1 to 2 pounds. This species should be selected for cultivation only in ponds of 2 or more acres

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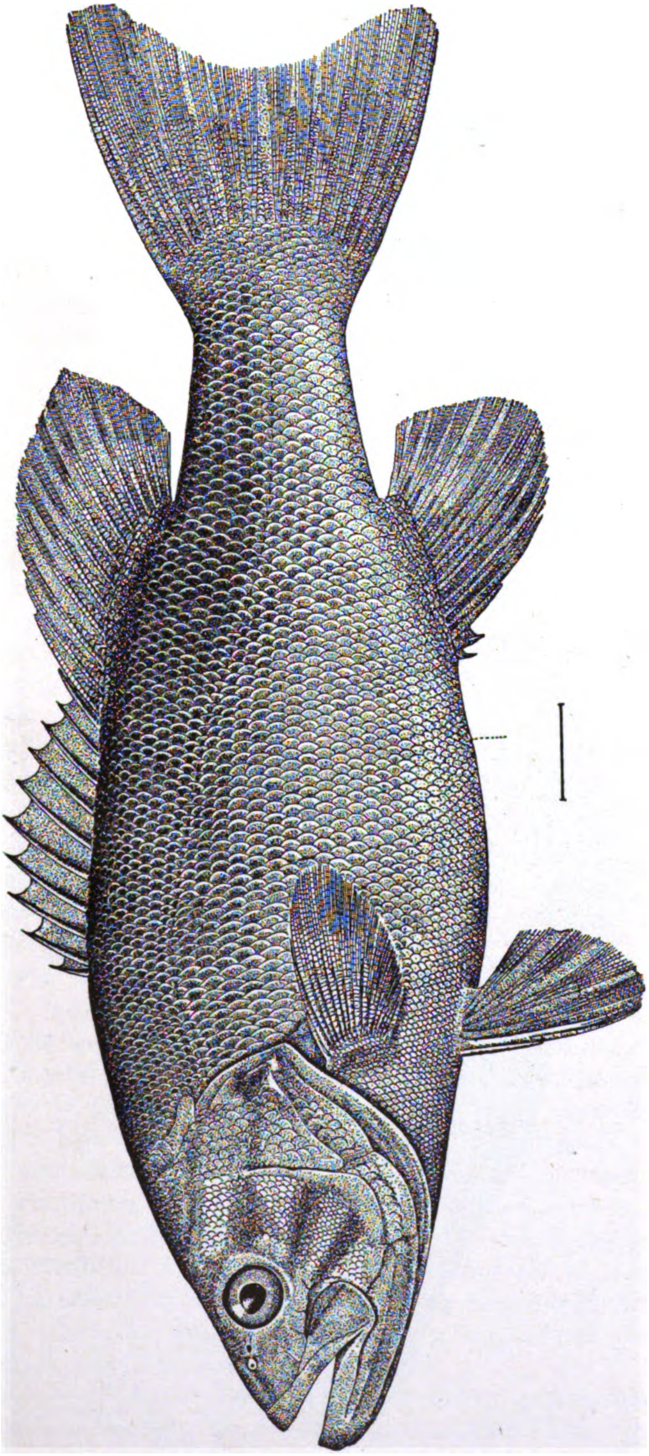
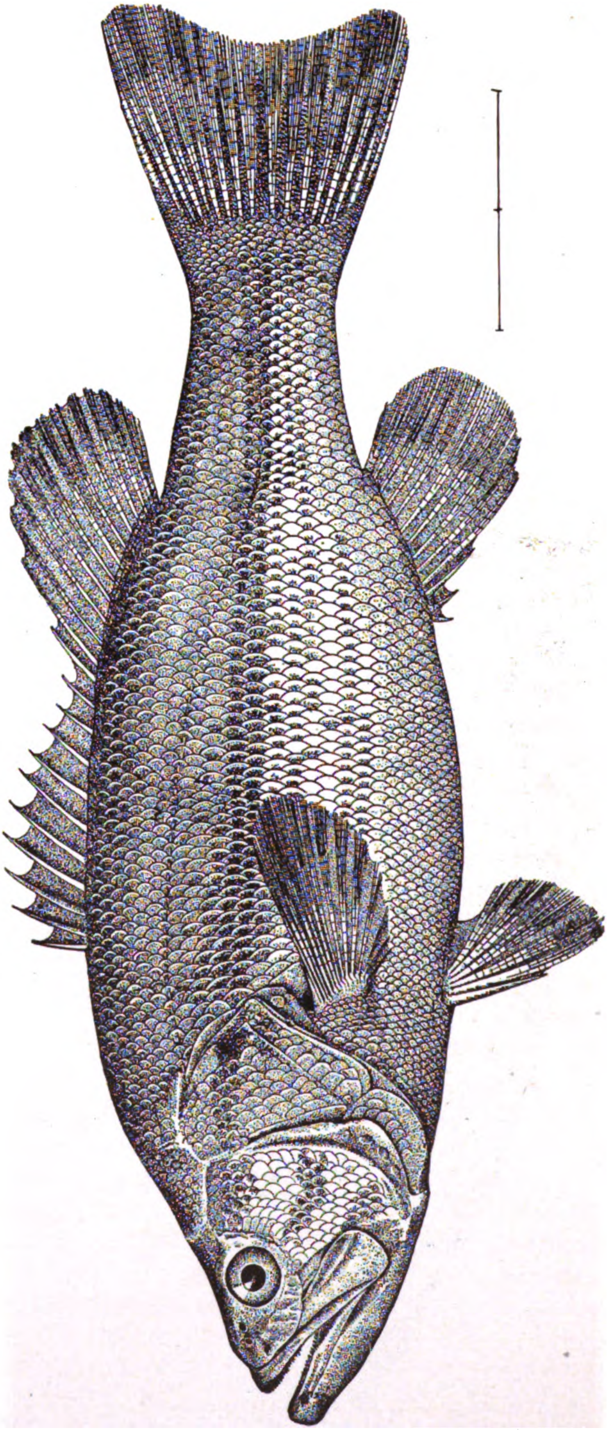
* All but one of the cuts published herewith are copied from Britton & Brown's "Illustrated Flora of North America." The figure of *Chara* is taken from the "Text Book of Botany," by Strasburger, Noll, Schenk, and Schimper.



SMALLMOUTH BLACK BASS.



LARGEMOUTH BLACK BASS.

in area, where the temperatures and other physical characteristics conform to those of its natural habitat. Rock bass and sunfish will live congenially with the smallmouth black bass, and can be successfully propagated in the same ponds with them.

LARGEMOUTH BLACK BASS (*Micropterus salmoides*).—Known locally as straw bass, green bass, bayou bass, Oswego bass, trout, and chub. Its range is from Canada to the Gulf of Mexico and from the Atlantic coast to the Rocky Mountains. The species is prolific in congenial waters, but reaches its greatest size in the warmer lakes and more sluggish streams of the South. Its maximum weight is authentically stated to be from 20 to 25 pounds, though in most localities it does not exceed a weight of 6 pounds, and the average is probably less than 3 pounds.

Because of their size and cannibalistic tendencies the two species of black bass should be selected only for ponds not less than 2 acres in area. The largemouth species is equally well adapted to cultivation in northern or southern climates, but its cultivation in the former should be restricted to waters attaining maximum temperatures. Crappie, sunfish, and warmouth bass are suitable species to introduce in waters with the largemouth bass.

The two black basses are frequently confounded, but they have contrasting marks of distinction, which vary somewhat with their environment. They may be reliably classified by the number of rows of scales on the cheek, the largemouth possessing 10 and the smallmouth 17 rows. The mouth of the former species extends back of the eye, and that of the smallmouth even with the anterior margin of the eye.

CRAPPIE (*Pomoxis annularis*).—Commonly called bachelor, campbellite, new light, sac-a-lait, tinmouth, crapet, and chinquapin. Its range is from New York and Vermont westward through the Great Lakes region and the Mississippi Valley to the Dakotas, and south to Texas. It inhabits sluggish muddy water and reaches a length of 1 foot in its most southerly range. The crappie is an excellent pan fish and should be generally cultivated where conditions are favorable. It is an extremely delicate fish to handle, its protruding eyes being easily injured and frequently blinded when constantly exposed to direct sunlight in clear water. In ponds devoted primarily to the propagation of crappie many fish-culturists introduce carp, suckers, or other bottom feeders, as the resulting turbid water seems to be a favorable condition for them. The natural habitat of the crappie suggests its suitability for ponds containing largemouth black bass or catfish, where the water supply is drawn from turbid streams or furnished by surface drainage.

CALICO BASS (*Pomoxis sparoides*).—Also known as strawberry bass, grass bass, and barfish. Is abundant in the Great Lakes region and the upper Mississippi Valley, with extreme range east to New Jersey and south to Texas. It very much resembles the crappie, but is hardier in every respect and better adapted to pond culture. It may be distinguished from the crappie by the presence of 7 or 8 spines in the dorsal fin, where the crappie has but 5 or 6. It will thrive in company with any of the pond species that are suited to relatively high temperatures.

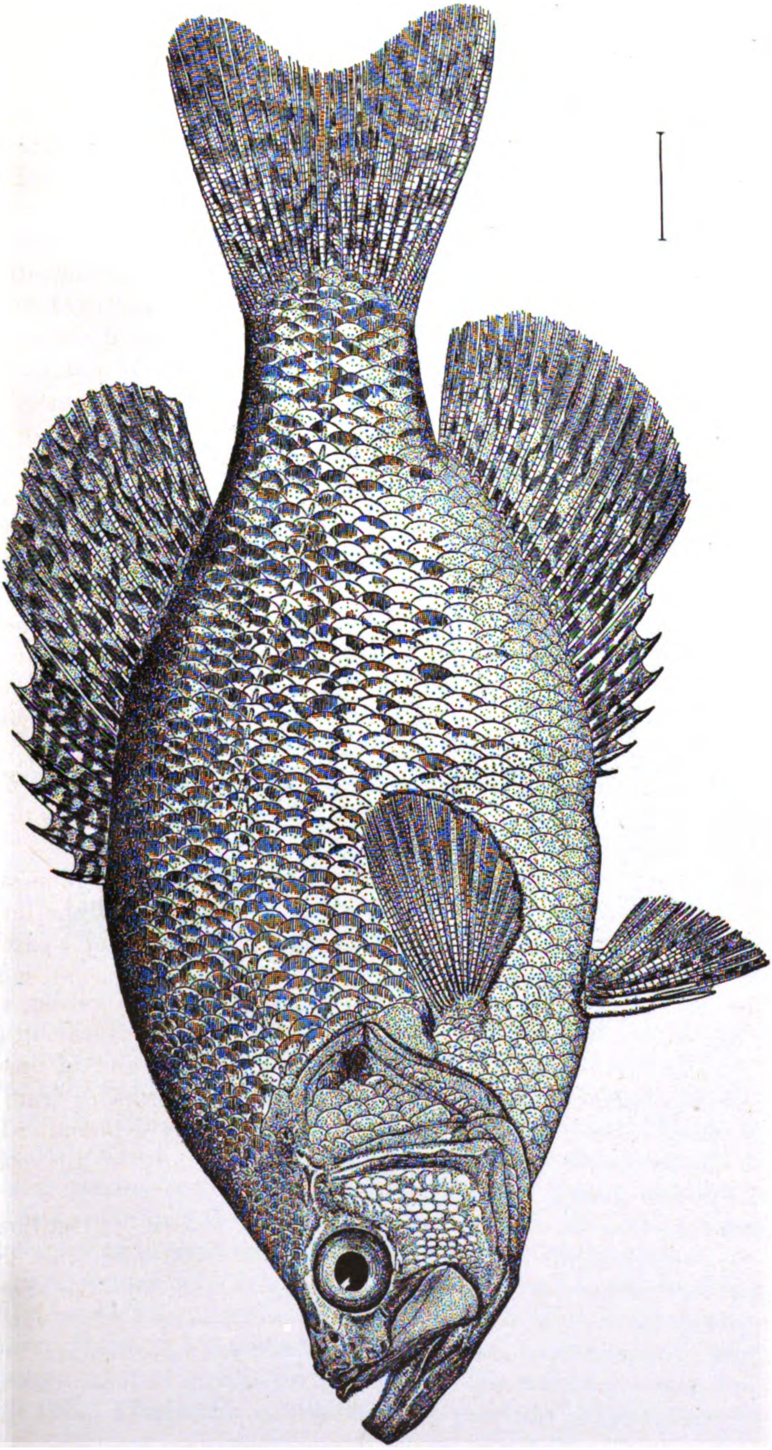
ROCK BASS (*Ambloplites rupestris*).—Colloquially termed red-eye and goggle-eye. This species is found in lakes and streams from New England to Manitoba and south to Louisiana and Texas, being particularly abundant in the cooler lakes and streams of the upper Mississippi Valley. It inhabits by choice only clear, cool waters, and is therefore less thrifty in its southern range. The rock bass has been known to attain a weight of 1½ pounds and a length of 12 inches, but the average specimen probably does not exceed a weight of one-half pound or a length of 7 inches. Fish of this species are well suited for introduction into spring-fed ponds with the smallmouth black bass.

WARMOUTH BASS (*Chænobryttus gulosus*).—Is often confused with the rock bass. It has very much the same range and similar general characteristics, but is better adapted to waters of a high temperature, and is therefore most abundant in the South. The two species may be distinguished by the three oblique dark stripes radiating backward from the eye in the warmouth bass and by the rather indistinct vertical stripes on the body of the rock bass. The warmouth bass may be propagated in conjunction with the largemouth black bass or in small ponds with the crappie and sunfish.

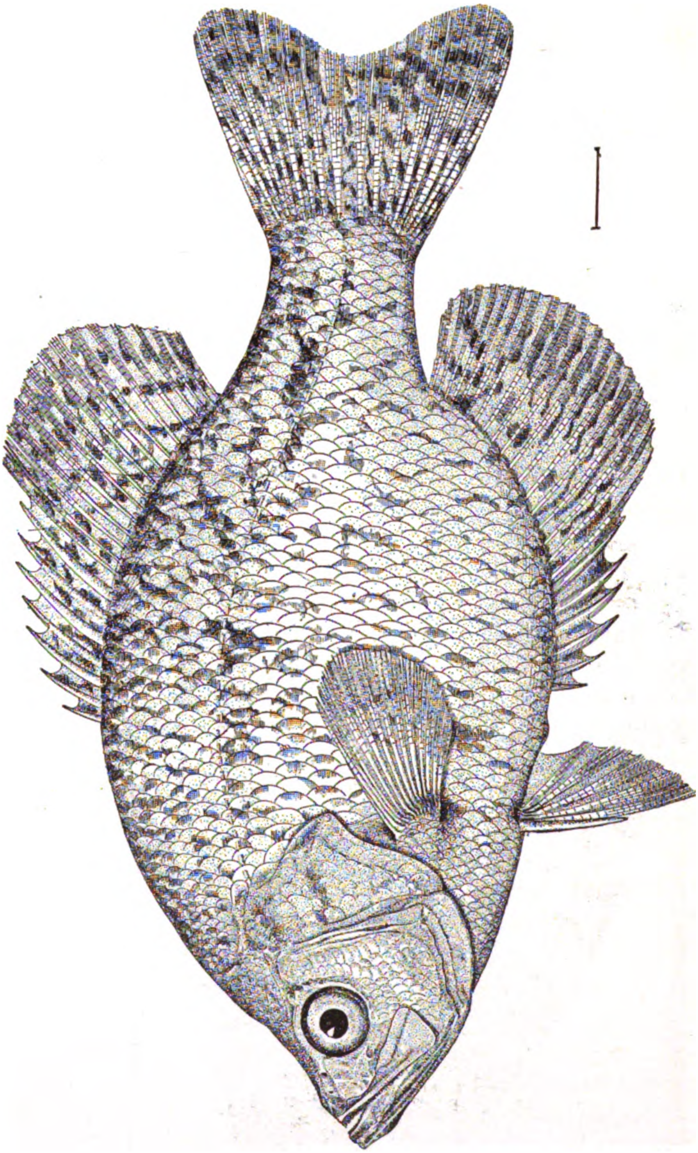
SUNFISH (*Lepomis incisor*).—Locally termed bluegill, blue sunfish, copper-nosed bream, dollardee, and blue bream. Of the many species of sunfishes distributed throughout the United States east of the Rocky Mountains, this is the only one that can be recommended by the Bureau of Fisheries as worthy of artificial propagation, and it is believed to be the finest pond fish available for private culture. It is adapted to practically all conditions, is prolific, and of unsurpassed table qualities. The largest specimens will measure from 12 to 14 inches in length and attain a weight of nearly a pound. The bluegill may be propagated in connection with any of the other species listed above.

CATFISH (*Ameiurus nebulosus*).—Locally known as bullhead, horned pout, Schuylkill cat, small yellow cat, and the subspecies *Ameiurus nebulosus marmoratus*, known in the South as marble cat. This is the only member of the catfish family that has so far been propagated in ponds. It is distinct from the genus *Ictalurus*, which embraces the larger catfishes—blue cat, channel cat, forked-tail cat, and spotted cat. Many attempts have

PLATE XI.



CRAPPIE.



CALICO BASS.

been made to propagate these latter species, but without success. They seem to require some element not found in still waters. The bullhead is abundant in all ponds, lakes, and sluggish streams of the eastern United States and the Mississippi Valley region. It adapts itself to widely varying conditions and demands less expensive preparation for its cultivation than any of the other fishes considered. The bullhead is the most easily domesticated of any of the pond fishes. Its appearance is formidable and repugnant to some, but when propagated in comparatively pure water it is very palatable. It may be cultivated in connection with any of the warm-water species referred to, and is particularly suited to the changing conditions of drainage-fed ponds.

NATURAL AND ARTIFICIAL FISH FOODS.

As with all forms of live stock, it is essential that brood fish be kept in a thrifty condition. Good food, proper shelter, ventilation, and exercise—familiar requirements to the farmer—have their equivalents in the food, physical characteristics of the pond, composition and aeration of the water, and the amount of space allotted to a given number of fish. Common sense, based upon observation of natural laws, will carry the fish-culturist a long way toward success.

All the fishes recommended for pond culture are naturally carnivorous, choosing live food through preference. Their predatory instinct in this respect can not be catered to exclusively where their culture is undertaken on an extensive scale, but the closer it is adhered to the better will be the results. It would be detrimental to the ultimate object in view to feed them live predaceous species of minnows, for those that were not devoured would prey upon the young of the species being propagated, and eventually, the minnow offspring would monopolize the vital resources of the water. The smaller minnows, with sucker-like mouths, may be advantageously liberated in the pond as food; for this purpose many fish-culturists utilize goldfish, which are herbivorous feeders and scavengers, and which, in limited numbers, do not materially lessen the supply of natural food available for the game fishes. Large numbers of goldfish would work injury through the destruction of aquatic plants, but if held in subjection the young goldfish constitute a superior food, and any that escape this destiny have a commercial value in their ornamental colorings.

Frogs, worms, and flying insects all contribute to the food supply of the brood fish, likewise the larger aquatic insects inhabiting the water. If not overstocked, therefore, the average pond may be managed so that it will furnish all the live food necessary for the adult fish. Where this is insufficient to properly maintain the stock, however, it may be supplemented by meat or, preferably, coarse fish, which should be cut in pieces small enough to be readily swallowed. Wild stock will refuse to accept this food until near the starvation point. Some will never do it, but the majority show such greediness for the substitute food, after having once tasted it, that they will follow the attendant about the pond whenever he appears.

Fresh livers and hearts are the materials most commonly used where a meat diet is employed, being the cheapest good materials obtainable; fresh fish is a more natural food, however. If the farmer is located within a reasonable distance of a fish market, arrangements can usually be made for regular deliveries of species having little or no commercial value, such as are incidentally taken by the fishermen in seining. If the magnitude of the operations will warrant, it is advisable to devote one pond to the propagation of carp for the sole purpose of producing food for the game fishes. Carp feed on vegetation and large numbers of them may be reared on a farm at little expense.

The amount of food required must be governed by the appetite of the fish. They should be given all they show eagerness for once a day. During the nesting season and the cold months practically no food is required, but especial care should be taken to feed them well both before and after the spawning period.

Crappie can rarely be taught to take artificial food, but fortunately it is seldom necessary to feed them or the breeders of other small species adapted to pond culture—the sunfishes and the rock bass. Catfish quickly learn the lesson and will consume with avidity raw or cooked meats, vegetables, and even hard grains.

DISEASES.

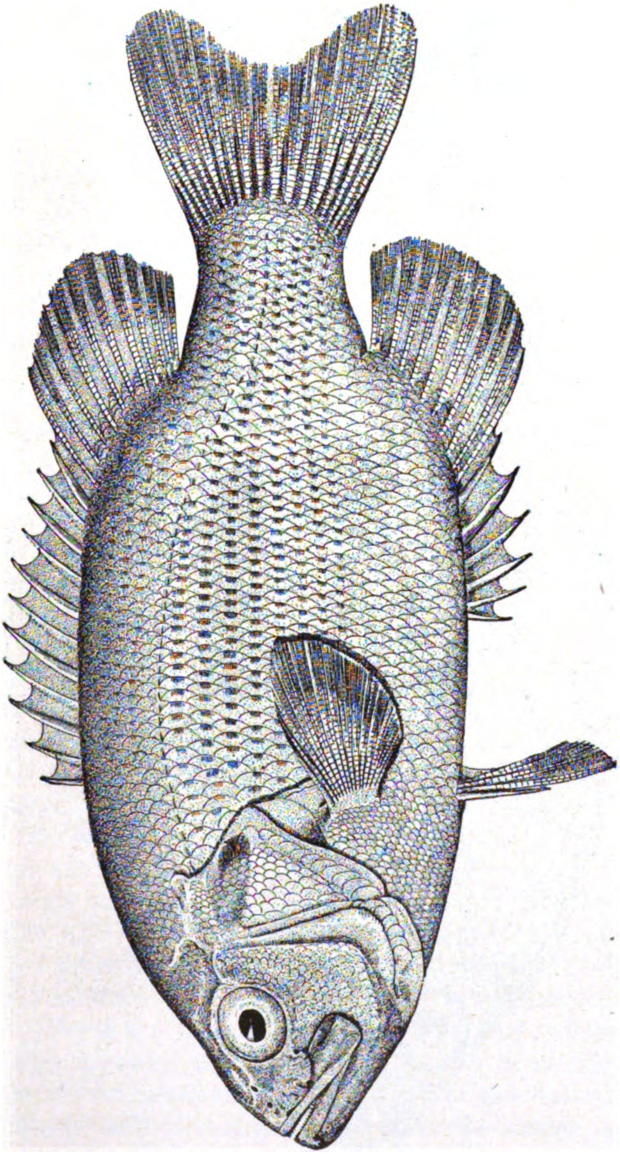
There are no diseases of pond fishes that can be successfully combated by artificial means. A well-fed fish is usually a healthy fish, whereas thin specimens are wanting in resistance to their habitual parasites and can not readily recover from external injuries. If they are fed well on as nearly appropriate foods as can be secured and are carried in ponds of natural characteristics, sickness will be of rare occurrence.

STOCKING PONDS WITH BROOD FISH.

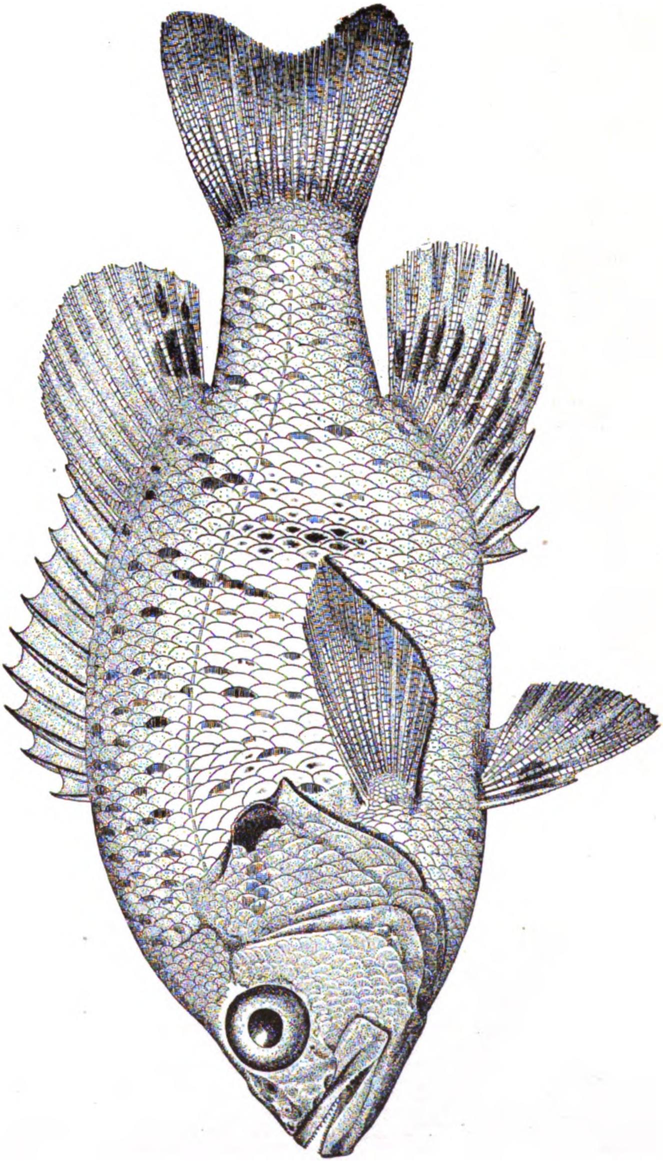
The most successful and the speediest results in pond culture are attainable by the use of adult fish for the original brood stock. These can in most cases be secured from the public waters of the immediate locality during the open season prescribed by the State laws.

It is such a common failing to want something new and strange that many prospective fish-culturists endeavor to procure some species

PLATE XIII.



ROCK BASS.



WARMOUTH BASS.

of fish that is foreign to their community with which to begin their operations. To illustrate some of the impractical ideas entertained, the Bureau of Fisheries is often asked to furnish the species of trout indigenous to the Great Lakes for stocking southern waters, or the flounder (a salt-water fish) for introduction into the ponds in the interior.

In general it may be assumed that the species which is the most prolific in the public waters of the region in question will be the likeliest to produce material results, and by procuring adult fish for breeders the pond in which they are placed should become stocked to its maximum capacity within a year. On the other hand, if State or Federal aid is relied upon only a limited number of fingerling or, at best, yearling fish will be available for beginning operations, and it will require from two to three years for them to mature and stock the ponds through natural reproduction.

The wisest course, then, will be to choose some native species and to make a persistent effort to secure adult specimens. This can best be done in the fall months, when the fish will more quickly recover from slight injuries which, during a period of high temperature, might develop into ugly sores and possibly kill them.

Fish hooked only in the mouth are in no way harmed for breeders, but the greatest precaution must be taken in holding them and in transporting them to the pond. Loosening or rubbing off of scales induces a fungus growth which will eventually spread over the body and result fatally. As the fish are captured they may be placed in buckets or tubs, which may be darkened by throwing an old blanket or carpet over the top. In changing the water, which should be done as often as the fish seem to require it, care should be taken not to excite them. When the fish are to be held for several days before they can be transferred to the pond, it is advisable to excavate a shallow basin at the margin of the lake or river where the collection is being made and arrange for a moderate flow of water from the main body through its entire length. A pool of running water 6 feet long, 3 feet wide, and from 12 to 18 inches deep will hold two or three dozen large fish with safety. Live boxes should not be used, as fish held in them will bruise themselves beyond recovery.

In conveying fish a considerable distance by rail or wagon, receptacles of such diameter that each specimen may lie at full length on the bottom should be provided. The depth of the water is a matter of less importance, but it should be kept at the proper temperature and well aerated. If necessary, ice may be used to maintain an even temperature corresponding to that from which the fish were taken; but if that be high and the distance to the pond great, it will be found easier to reduce the temperature to 65°, and gradually raise it when nearing the destination to conform to that of the water in which the fish are to be liberated. During conveyance the water in the receptacles will be kept in motion and adequately aerated; but when standing still it must be artificially aerated by dipping out some water and pouring it back into the receptacle from a height.

The ordinary 10-gallon can is employed by the Bureau of Fisheries for the transportation of small fish, but if the fish are too long for its diameter nothing is better than wash boilers. Any clean receptacle may be used, but those mentioned are the most convenient to handle.

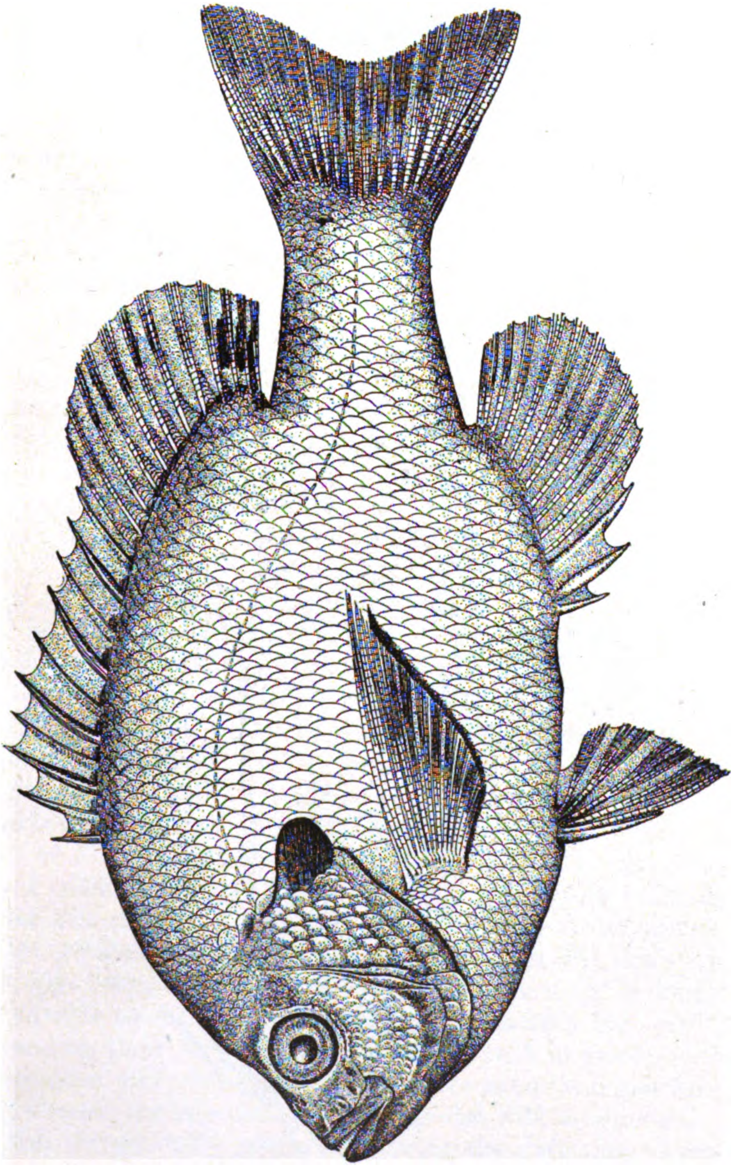
If the use of artificial food is not contemplated, the number of brood fish allotted to a pond must be apportioned to the natural food available for both the adults and the expected fry and fingerlings. Fifty of either species of black bass or 100 specimens of any of the smaller species are maximum numbers for an acre of water, where the offspring is to remain in the brood pond. These numbers should produce a much larger number of fry than the waters can sustain until mature, but allowance will have to be made for losses through cannibalism and the ordinary vicissitudes of their environment. Promiscuous collections of fish will invariably run about equally as to sex, and the numbers recommended will therefore give 25 and 50 pairs, respectively.

There are no external markings by which the sex of pond fishes can be positively determined, but the female black bass usually presents a more mottled appearance than the male and her colors are brighter.

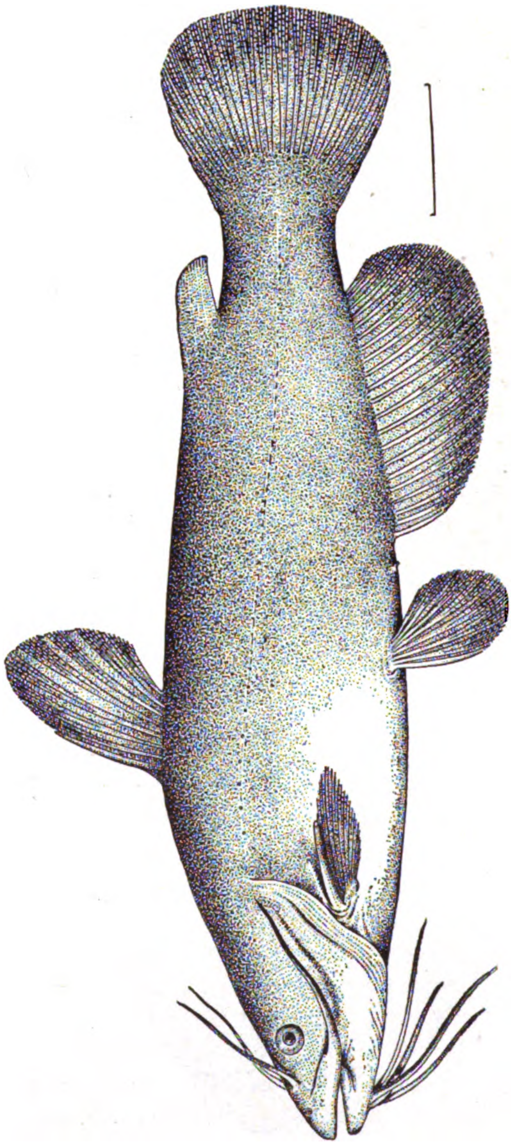
SPAWNING SEASON.

Black bass will nest in the spring when the water temperature rises above 60° F. Ordinarily 63° F. will bring about deposits of eggs, but if the season is a backward one, the fish may spawn at 58° F. On the other hand, an unusually advanced season may not bring results until the temperature exceeds 65° or 68° F.

Suitable temperatures for spawning prevail in the more southerly States as early as February; in the latitude of Tennessee, in March; in southern Illinois, during April; in Iowa, during May; and in northern Minnesota, in June. The spawning season extends over two or more weeks, and is usually marked by two periods of intense activity, following a rise in temperature after several days of abnormally cool weather. In the Southern States the nesting season is not so sharply defined, owing to the almost continuously favorable temperatures throughout the year, which cause rapid development of the ova. At the Texas station of the Bureau of Fisheries there regularly occurs a hatching period in February, one in April, and scattering hatches throughout the summer. The crappies, sunfishes, rock bass, and catfishes will spawn from one to two months later than



BLUEGILL SUNFISH.



CATFISH OR BULLHEAD.

the black bass in the same waters, and the sunfishes and rock bass will continue nesting to some extent until the approach of cool weather in the fall.

SPAWNING HABITS.

Ordinarily ponds will require no special preparation for the spawning season. Some of the species choose the roots of water plants on which to spawn, while others seek out gravel spots and find them, however much they may be hidden by deposits of mud. Catfish burrow into embankments and under rocks and logs, and it is well to provide substitutes for such shelters where this species is being propagated, for which purpose heavy planks weighted to the bottom of the pond will be suitable and will offer the least impediment to seining operations later on.

With the right material at hand the male will prepare the nest to his precise taste and after its completion will seek a partner. There are many ups and downs in the domestic life of fishes, especially in the case of such pugnacious species as the black basses. The battles of the males for favorite females are liable to cause injuries resulting in death; or after being won, a consort may prove not sufficiently advanced in maturity, in which case the fish separate and the male continues his search for a more congenial mate.

Actual spawning will extend over several hours, the eggs being emitted and fertilized at varying intervals.

All the eggs carried by a female may not be ripe at one time, and the male will repeatedly seek new mates until the nest has been stocked to his satisfaction, driving each companion away when she ceases to perform the function for which she was obtained. The eggs are adhesive, and attach themselves to gravel, roots, or other material on the beds. The male remains on the nest during the entire period of incubation, fanning the eggs clean of sediment with a gentle motion of his fins and watchfully guarding against the encroachment of other fishes on his domain. He is the personification of valor at this time, and all other creatures in the pond apparently have the greatest respect for him. Nothing but the loss or death of the eggs from low temperatures, heavy deposits of sediment, or other adverse conditions will cause him to abandon his nest. Notwithstanding their ferocity, black bass will nest in close proximity to one another and attend to their respective parental duties in entire amity, whereas the approach of a strange fish will be resented.

Sunfish are decidedly gregarious during the spawning season and will locate their nests very closely together. With them all is harmony, the sole thought of each appearing to be centered upon his own particular business.

The crappies spawn in comparatively deep water on isolated nests. Owing to their color, the depth of the water, and its usual turbidity, but few observations have been made of their peculiar characteristics at this period.

Rock bass and warmouth bass deposit their eggs on gravel beds of greatly varying diameters, and their spawning instincts are somewhat similar to those of the black bass, though in a less marked degree.

By reason of their intrepidity at the time, all of the species referred to appear to be very tame while guarding their nests, but this instinct should not be presumed upon by permitting unnecessary disturbances about the beds.

The incubation period of eggs of the various pond fishes ranges from a few days to two weeks or more, depending upon the mean water temperature. A drop below 55° F. is invariably fatal, while the percentage of hatch below 58° F. is greatly reduced.

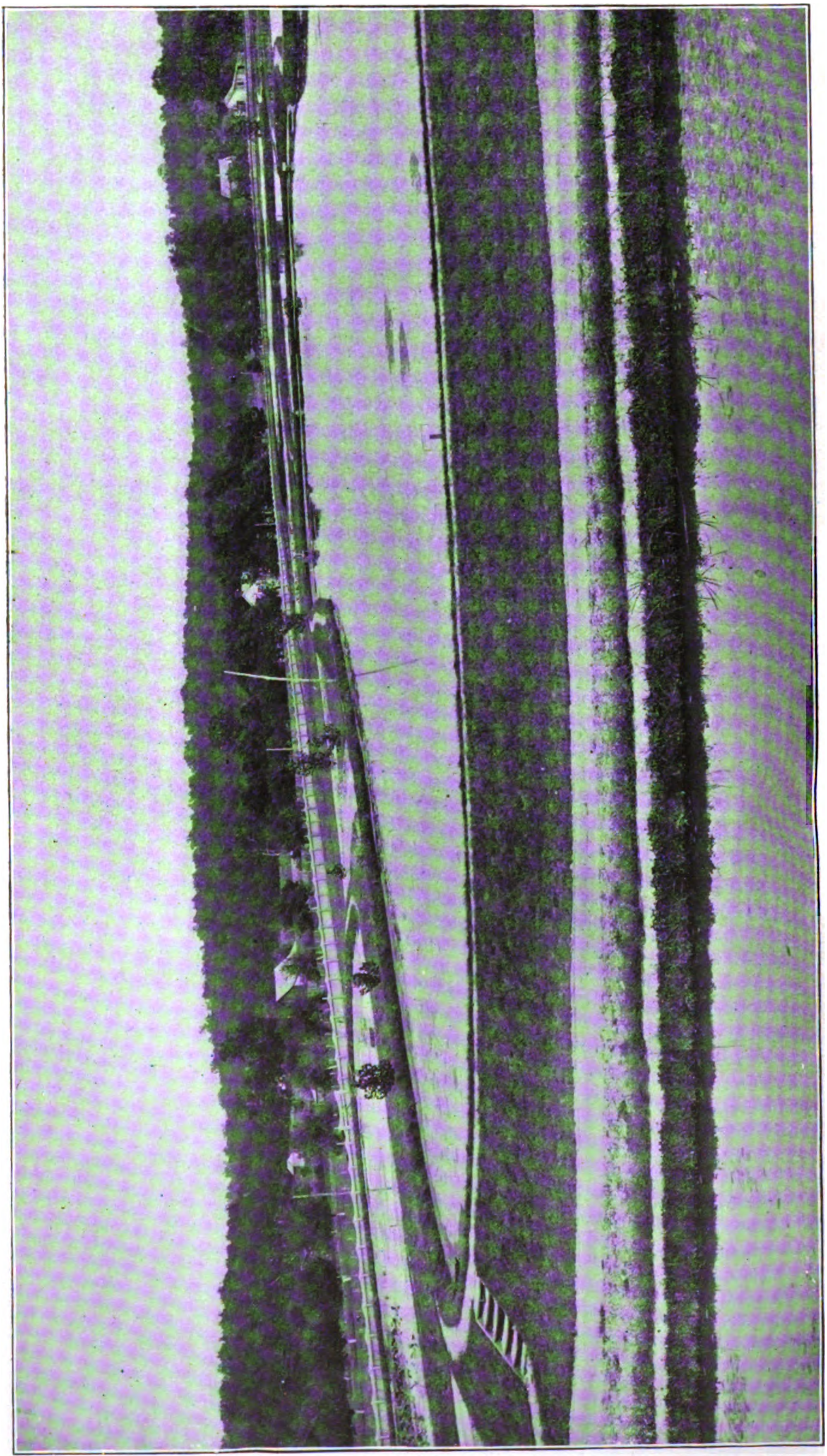
Under uniformly favorable conditions healthy eggs will hatch without any loss to speak of, but the average hatch of domesticated stock is not over 50 per cent. This, however, is a sufficiently large percentage to make pond-fish culture profitable.

CHARACTERISTICS OF THE YOUNG FISH—THEIR FOOD AND GROWTH.

When first hatched the fry of most of these species are colorless, and because of their tendency to collect among the roots and in the crevices of the spawning beds are difficult to find. They become darker in a few days, however, and are easily distinguished. In a short time they rise a few inches off the bed during the day and return to the bottom at night, increasing the distance each day until they eventually reach the surface. During all this time the parent fish has given them the same sedulous attention as when they were in the egg stage. Gradually the school enlarges in circumference to such an extent that he has difficulty in keeping his brood together. He crowds them into shoal water—their natural feeding ground—and patrols the shore in an effort to ward off enemies, but they finally separate into small bands, escape the vigilance of their guardian, and become free lances in the strife for survival.

The largemouth black bass and catfish fry school much longer than the other species mentioned; in fact, catfish fry retain this gregarious tendency throughout the first year, while young black bass remain together until 2 inches or more in length.

Young sunfish and catfish are easily taught to take artificial food, when the natural food of the pond is insufficient for their nourishment. As with the adult fish, animal tissue is the most readily ac-



BASS PONDS AT NEOSHO, STATION, MISSOURI.

cepted, and will produce the strongest growth, though cooked cereals or vegetables will answer, and are even relished by young catfish when given in the raw state.

The food should be scattered along the natural feeding grounds, starting with a small amount and increasing the quantity to what the fish will daily consume. Care should be taken to prevent the pollution of the pond through the decomposition of excess food.

The young basses and crappies can not be successfully fed, and must depend entirely upon the insect life in the pond for their sustenance. For this reason no more young fish of these species should be carried in a pond than the natural food supply contained therein will support.

When such food is inadequate for the number of fish in a pond the only alternative will be the provision of additional ponds, to which a portion of the fry may be transferred for rearing. A public-spirited course would be to plant the surplus stock in neighboring public waters, taking care not to introduce them into streams and lakes which should be reserved to trout or salmon, as their presence would be detrimental to the latter species. Such a policy pursued by several fish-culturists in a given vicinity would maintain good public fishing, without diminishing to any appreciable extent the quantity of edible fish in the waters under private control. Ordinarily well-constructed ponds are capable of producing from two to ten times the number of fry that can be reared therein. The surplus is of some value as food for the stronger specimens, but would be of much greater value if liberated in adjacent lakes or streams.

CAPACITY OF A POND FOR THE PRODUCTION OF FISH.

It is difficult to estimate the capacity of ponds for the various stages in the growth of fish. It depends for the most part upon the amount of appropriate food available. A 2-acre pond producing 10,000 one-year-old black bass from 4 to 6 inches long would be a remarkably successful enterprise, and 20,000 one and one-half to two inch yearling crappie or sunfish to an acre of water would be likewise notable. These numbers have been realized and in some instances exceeded, but the average results are doubtless much smaller.

The stock will be decreased through cannibalism at least 50 per cent by the end of the second year, and the yearlings held over will consume a large percentage of the fry hatched during the second and succeeding years of operations. Enough should survive, however, to maintain the adult stock at the maximum number that the pond will support.

In waters of high temperature those species adapted to culture in ponds will attain maturity and reproduce at the age of 2 years. In cool waters reproduction may be delayed until the fourth year, or in case the species is very poorly adapted to the temperature conditions the fish may remain small, stunted specimens throughout life and never reproduce.

ENEMIES.

There are many enemies of fish, especially of fry and fingerlings, against which the fish culturist must wage continual warfare. The heaviest losses will be from cannibalism, and these will be gauged by the balance of the food and fish in the pond. Some species are more predaceous than others. For this reason black basses, the scourge of restricted waters, are recommended only for large areas of the highest fertility. Such species as pike and pickerel should never be selected for culture in ponds, as they are the most piratical and devastating fishes inhabiting fresh waters.

It is necessary to guard closely against the inadvertent establishment in a pond of any undesirable species of fish or animal. Turtles and snakes will consume large numbers of fry and fingerlings in the course of a season and should be barred from the waters as strictly as possible. Kingfishers, herons, ducks, mudhens, fish hawks, etc., soon locate a pond and prove most persistent poachers. Powder and shot is their most effective deterrent. If inroads on the stock are made by mink, they should be trapped in season—at a time when they will, at least in part, make reimbursement for their board. Muskrats, while not fish destroyers, work havoc with pond embankments and should be exterminated.

METHODS EMPLOYED BY THE BUREAU OF FISHERIES IN THE DISTRIBUTION OF FISH.

The Bureau of Fisheries will undertake to furnish fish to individuals for stocking public and private waters. Blanks upon which to submit formal application will be supplied on request. Assignments of fish are made large enough to form the nucleus for a brood stock for a given area of water, and are delivered at the applicant's railroad station free of charge. From the information given in these applications the Bureau decides as to the suitability of the waters for the fish asked for and reserves the right to substitute other species if in its judgment the applicant's selection is ill chosen or it is impossible, with its limited facilities, to supply the species specified within a reasonable length of time.

None of the pond fishes recommended in the foregoing pages will be furnished by the Bureau for stocking lakes or streams in Washington, Oregon, California, Idaho, Nevada, or the western portions of Wyoming or Montana, as it is believed their introduction into such waters might prove detrimental to the important salmon and trout fisheries of the Pacific coast.

Basses, crappie, and sunfishes are propagated at 13 of the Bureau's stations, ranging in location from Vermont to South Carolina and from Texas to Iowa. However, the facilities at these stations are entirely inadequate to fill the rapidly growing demands, and the Bureau has for some years supplemented its supplies by collecting young fish of the species named from the overflow waters of certain rivers in the Mississippi Valley, where they are indigenous.

No source of supply can be relied upon. A sudden change in temperature during the spawning season may cause a year's failure at an important pond-culture station, and, unfortunately, this critical period occurs at a time when sudden climatic changes are natural. The success attained in collecting young fish from overflow waters depends upon favorable water stages, not only at spawning time but throughout the collecting season; as widely varying water stages are encountered from week to week and from year to year, the results of a season's work can not be foretold with any degree of certainty.

It is the policy of the Bureau to fill applications, so far as practicable. in the order of their receipt, and the allotments are as liberal as circumstances will permit. Aside from the uncertainty as to the stock of fish available for distribution, there are other factors governing the size of allotments and the time of delivery that are not generally understood.

On account of the greater value of fingerlings than fry for stocking purposes and the proportionate difficulty and expense of producing the larger fish, it is of course impossible to supply them except in comparatively limited numbers. It has been estimated that 350 fish 1 inch long are of more value than 1,000 fry, and that 25 fish 6 inches long are the equivalent of 100 only half as long. This is approximately the ratio of decrease experienced in rearing fingerling fish at the Bureau's stations, and allotments to applicants are governed accordingly.

The distribution operations of the Bureau of Fisheries close with the fiscal year ending June 30. At the opening of the new fiscal year all applications on hand are listed and arrangements are made to supply the fish assigned thereon before the following winter so far as the stock available will permit. Applications received after the opening of the fiscal year can not be filled in the same calendar year, unless there happens to be a surplus stock after deliveries have been made on all listed applications.

There are two distinct periods of distribution—one of fry in the late spring months, the shipments being forwarded in charge of messengers direct from the stations where the fish are propagated, and the other by the Bureau's cars, which extends from early in July until late in the fall. The later distribution is of fingerling fish, their size increasing as the work progresses.

The distributions are arranged to cover the country by States or groups of States, and individual trips are routed in such a way as to most effectively and economically supply all applicants of a particular section of a State. The Bureau does not carry at all times a supply of fish that can be delivered on demand. Fish reproduce only once a year, and when the supply for any one year is exhausted it is necessary to wait another year, or until the next breeding season, before another supply can be obtained. Rarely is a second trip made over a route in the course of a year, and if for any reason an applicant fails to meet the Bureau's messenger and receive his consignment, the application is held for another attempt the following year. Only in extraordinarily good seasons can the entire area of the United States be covered. Each section is supplied in turn, so far as practicable, priority being given to the older applications on file.

Applicants are notified from 30 to 60 days in advance of the contemplated shipments of their fish, and a second notice, specifying the exact time of arrival, is sent by the messenger while en route. Every precaution is taken by the Bureau to avoid misunderstandings, and it is essential that applicants follow all the instructions they may receive.

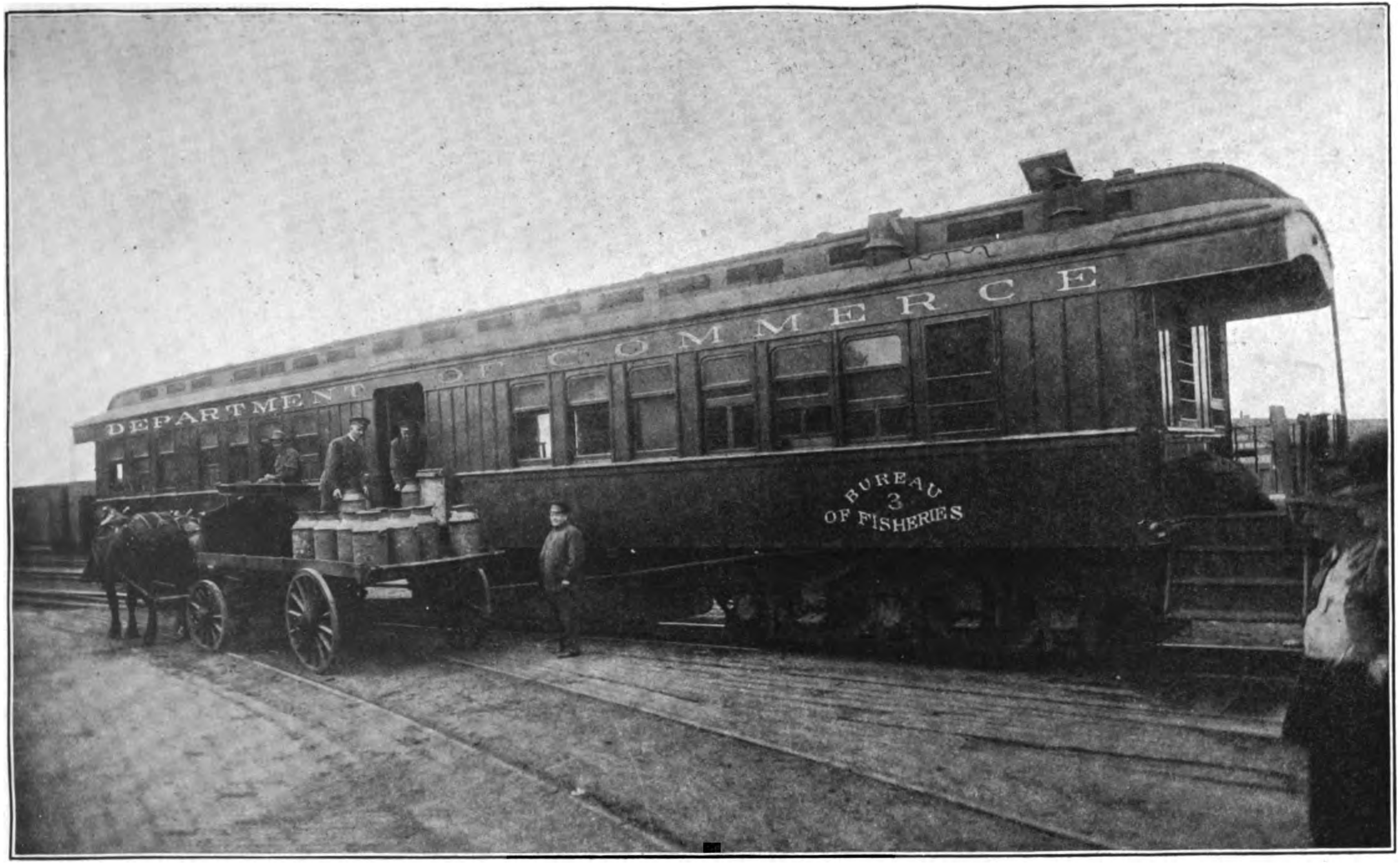
REMOVING FISH FROM PONDS.

In removing fish from a pond at any time the same care should be exercised as in handling stock, due precaution being taken to reserve the best specimens for breeders, and to retain a sufficient number for future reproduction. Their number and size must be left to the judgment of the proprietor of the pond, as it will vary greatly with the character of the water, size of the pond, climatic conditions, and geographical location.

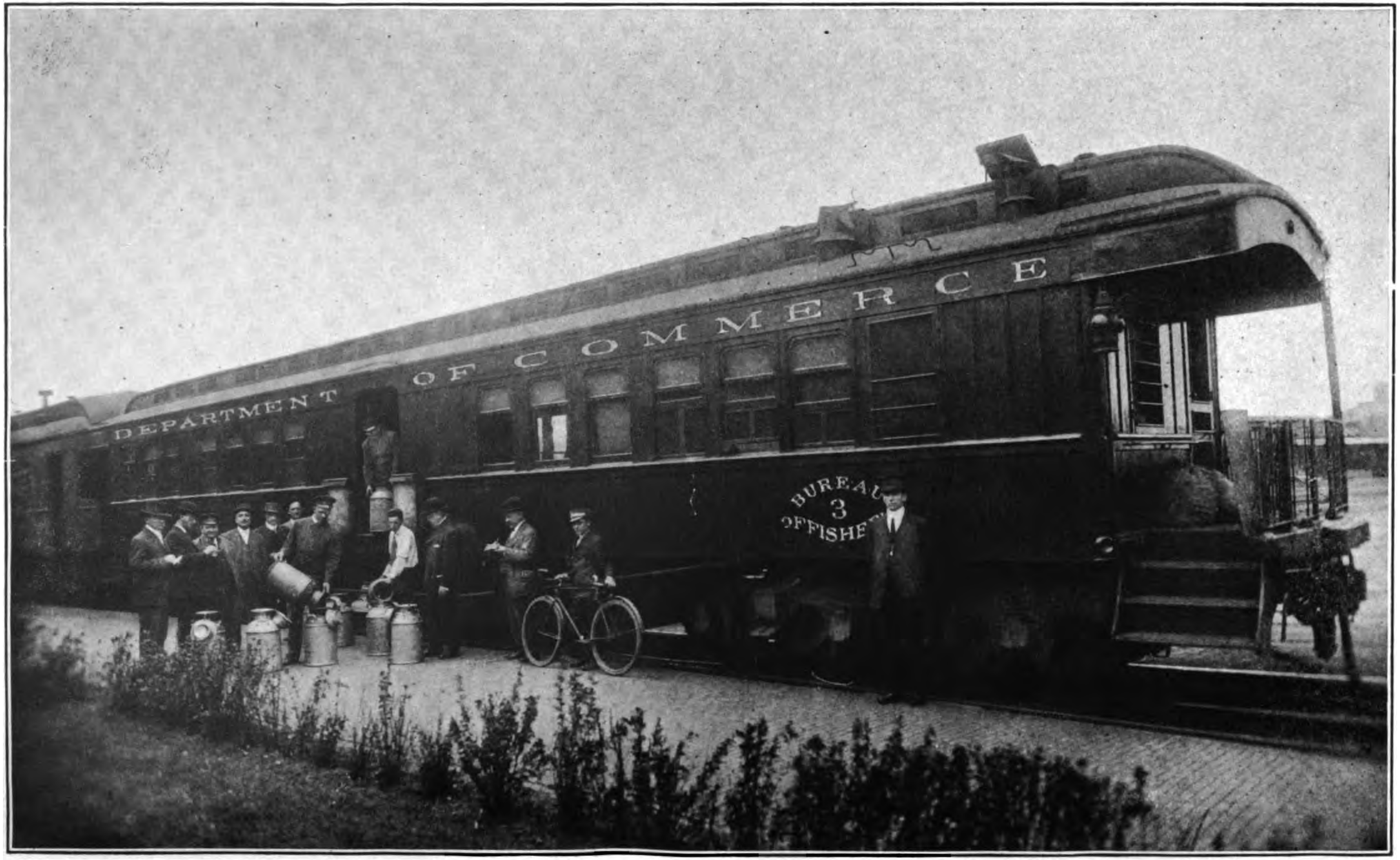
In southern latitudes pond fishes commence nest building in March, while farther north, in Iowa and Illinois, reproduction does not occur until May or June. Young fish recently hatched are very tender and should not be molested for at least 30 days.

Care should be taken in removing adult fish from a pond, especially during the spring and summer months. In making the selection the larger fish should be preferred to the medium-sized ones, as the larger specimens are very destructive to the smaller fish. They are not as prolific as those of average weight, and have usually attained their size through cannibalism.

If a few fish for table use are desired, and one has the time, they can probably best be taken with hook and line. A fyke net might be used under certain conditions, or a few may be taken in a tray constructed of light wooden framing, covered with netting or galvanized wire cloth of about 1-inch-square mesh. The trap should have a cone-shaped entrance for the fish, and the interior should contain a few minnows in a wire cage which are used as bait.



LOADING CAR WITH FISH FOR DISTRIBUTION.



DELIVERING FISH TO AN APPLICANT AT RAILROAD STATION.

Where many fish are to be removed from a pond a seine should be employed. To use it to the greatest advantage about one-third of the water should be drawn off; this will cause the adult fish to congregate in the deeper waters, where they may be more readily secured. The water should be drawn off slowly in order to give the small fish a chance to follow it down.

Before drawing the pond the vegetation should be removed from the lower portion of the pond where the seine is to be hauled. It may either be cut or raked out with a long-handled garden rake from the bank. Wading in the pond is to be avoided, as it makes the water roily and leaves deep holes in the bottom, in which the young fish are apt to be caught.

In lowering the water, vegetation of a rank and dense growth is very apt to settle down and smother the young fish. It should be moved as soon as observed, but cat's-tail and other plants having stems of sufficient strength to support them in an upright position need not be removed, unless this is necessary in order to haul the seine.

In many instances it might not be necessary to draw off the water if the vegetation were removed from a portion of the pond and the fish fed regularly in the cleared space, for, with care, a seine could be passed around them and a large number secured.

It is inadvisable to draw a pond during the warm summer months unless one has the supply of water available to refill it at once. Better results are attained by drawing off the water in the cool fall months, but even then one should be sure of being able to refill the pond before freezing weather. For this reason it is believed that seining with a large net in the clearing where the fish have been accustomed to feed would give the best results.

When the proper amount of water has been drawn off the seine should be laid out from a boat and hauled toward the bank at the deeper end of the pond. In case the deepest place is near the middle of the pond, it will be necessary to work the seine around the fish and haul it toward the nearest bank.

Should more fish be removed from the pond than is desired for immediate use, the surplus can be placed in a floating live box anchored near the outlet or where the water is deep. This box may be made of wooden slats placed far enough apart to permit a free circulation of water and yet retain the fish. The slats should be nailed to a small frame of 2 by 2 inch material, forming a box 16 feet long, 4 feet wide, and 3 feet deep, and provided with a hinged cover.

If preferred, a small inclosure in the pond fenced with galvanized wire might be provided for holding surplus fish, removing them when required with a large hand dip net or a small seine. The advantage of the inclosure over the live box is that it will not crowd the fish, and they are thus held under more natural conditions.

ALASKA FISHERIES AND FUR INDUSTRIES IN 1915

By WARD T. BOWER, *Agent,* and HENRY D. ALLER, *Assistant*

Appendix III to the Report of the United States Commissioner of Fisheries for 1915

CONTENTS.

Page.

Introduction 7

FISHERY INDUSTRIES.

Waters closed to commercial fishing 9
Patrol boats 10
Violation of laws and regulations 11
Alaska legislative notes 13
Wood River census 15
Aleutian Islands Reservation 16
Afognak Reservation 17
Complaints by natives 19
  Copper River 19
  English Bay 20
Salmon hatcheries 21
  Extent of operations 21
  Hatchery rebates 21
  Hatchery inspection 22
    Yes Bay 22
    Afognak 23
    Uganik 24
    Seal Bay 24
    Fortmann 24
    Karluk 26
    Quadra 26
    Hetta 27
    Klawak 27
General statistics of the fisheries in 1915 28
Salmon industry 30
  Salmon canning 30
    Changes in canneries 30
    New canneries 31
    Canneries operated in 1915 32
    Canneries not operated in 1915 33
  Salmon catch and forms of gear 33
  Statistics 35
  Disasters and losses in the salmon industry 38
  Mild curing of salmon 39
  Salmon pickling 41
  Salmon freezing 43
  Fresh-salmon trade 44
  Dry salting, drying, and smoking of salmon 44
  Salmon by-products 45
    Statistical summary 46
  Salmon in the Yukon 46
  Injury to salmon by birds 47
  Destructiveness of hair seals in the salmon fishery 47

Page.
Halibut fishery........ 51
  Statistical summary........ 54
Cod fishery........ 54
  Vessel fishery........ 54
  Shore stations........ 56
  Statistical summary........ 56
Herring fishery........ 57
  Statistical summary........ 58
  Inquiry regarding waste of herring........ 59
Whale fishery........ 63
  Shore stations........ 63
  Offshore whaling fleet........ 64
  Statistical summary........ 65
Minor fisheries........ 66
  Trout........ 66
  Black cod........ 66
  Atka mackerel........ 67
  Mussels........ 68
  Crabs........ 68
  Clams........ 68

FUR-SEAL INDUSTRY.

Pribilof Islands........ 69
  General administrative duties........ 69
  Purchase and transportation of supplies........ 69
    Supplies........ 69
  Personnel........ 70
  New regulations........ 71
  Natives of the Pribilof Islands........ 72
    Support........ 72
    Health........ 72
    Water supply........ 74
    Schools........ 75
    Savings accounts........ 80
    Census........ 81
  Fur-seal herd........ 82
    Killing of seals........ 82
    Census of the fur-seal herd........ 83
    Branded seals........ 97
  Foxes........ 103
  Reindeer........ 104
  Radio service........ 104
Patrol of the North Pacific Ocean and Bering Sea........ 105
Sealing privileges accorded aborigines........ 105
Disposition of skins shipped from Pribilof Islands in 1915........ 106
Postponement of sale of sealskins........ 106
Dressing and dyeing of fur-seal skins........ 107

MINOR FUR-BEARING ANIMALS.

Field work........ 108
Regulations........ 108
Seizures and prosecutions........ 110

Page.
Fox farming........ 111
  Kodiak-Afognak region........ 112
    Kodiak fox farm........ 112
    Other fox farms in Kodiak-Afognak region........ 130
    Early fox farming in this region........ 133
  Fox farms in the Copper River district........ 135
  Fox farms on the Tanana River........ 136
  Fox farms on the Yukon River........ 136
  Miscellaneous fur farming........ 137
Conditions in the Bristol Bay region........ 138
Shipment of furs from Alaska........ 138
Miscellaneous notes........ 139
Leasing of islands........ 140

ALASKA FISHERIES AND FUR INDUSTRIES IN 1915.

By Ward T. Bower, *Agent*, and Henry D. Aller, *Assistant*.

INTRODUCTION.

The activities of the Bureau of Fisheries in Alaska fall into three general classes, as follows: (*a*) The enforcement of the law and regulations having to do with the protection and conservation of the fisheries and the operation of hatcheries, (*b*) administrative work in connection with the American fur-seal herd of the North Pacific Ocean, and (*c*) the enforcement of the law for the protection of the fur-bearing animals in Alaska generally.

Under the first head the work is directed not only to the enforcement of the law and regulations in respect to the fisheries, but contemplates such investigations and inquiry along scientific and economic lines as facilities permit. Another important feature is the statistical review of the fisheries and discussion of the methods, which is prepared each year. Still another phase of this part of the work is inspection of the private hatcheries.

The activities of the Federal Government in respect to the North American fur-seal herd are concerned in large measure with enforcing the provisions of the North Pacific Sealing Convention of July 7, 1911, and the act of Congress giving effect to that convention, approved August 24, 1912. The taking of these seals at sea is prohibited and the killing of them at the Pribilof Islands, the only place at which the seals come to land, is limited to the number necessary to supply food for the native inhabitants. Under restricted conditions descendants of aboriginal inhabitants dwelling on the North American coast may take seals at sea.

The three important positive duties having to do at the present time with the fur-seal herd are (1) the administration of the Pribilof Islands Reservation, (2) the marketing of the skins belonging to the Government taken at the Pribilof Islands, and (3) the patrol of the North Pacific Ocean and Bering Sea for the prevention of pelagic sealing. The administration of the Pribilof Islands Reservation and the marketing of skins is performed under the direction of the Department of Commerce; the work of patrolling the North Pacific Ocean and Bering Sea is performed by vessels of the Coast Guard detailed for that purpose.

The general law for the protection of fur-bearing animals, approved April 21, 1910, places the duty of the enforcement of its provisions upon the Department of Commerce. The law itself forbids the killing of any fur-bearing animal in Alaska but authorizes the Secretary of Commerce to establish by regulation open seasons for the various animals. Fur seals and sea otters, while included within the scope of this general law, are also made the subjects of special legislation. The enforcement of the law and the regulations for the protection of the fur-bearing animals in Alaska by the department, aside from the Pribilof Islands, rests largely upon the wardens employed under the immediate direction of the Bureau of Fisheries. In addition to their other duties the wardens collect information in regard to the abundance, distribution, and natural history of the various fur-bearing animals. Attention is also given to the operations of fur farms, and information in regard to this industry is collected whenever possible. Statistics in regard to the shipment of furs from Alaska are secured by a system of reports made direct to the Bureau of Fisheries, which are as far as practicable checked with the records of the collector of customs at Juneau.

FISHERY INDUSTRIES.

As in similar reports for previous years, the Territory of Alaska is here considered in the four coastal geographic sections generally recognized as follows: Southeast Alaska, embracing all that narrow strip of mainland and the numerous adjacent islands from Portland Canal northwestward to and including Yakutat Bay; central Alaska, the region on the Pacific from Yakutat Bay westward, including Prince William Sound, Cook Inlet, and Chignik; western Alaska, the shores of Bering Sea, tributary waters, and the islands in Bering Sea; and arctic Alaska, all that portion of Alaska facing on or tributary to the Arctic Ocean.

Detailed reports and statistical tables dealing with the various fishery industries are presented herewith, and there are also given the important features of certain subjects which were the object of special investigation or inquiry.

WATERS CLOSED TO COMMERCIAL FISHING.

It being deemed desirable by the department to designate certain waters as salmon-breeding reserves in southeast Alaska in addition to those previously selected for that purpose, a hearing was held at Seattle, Wash., October 1, 1915, in order to give persons interested an opportunity to present their views.

The hearing further confirmed the department's opinion as to the desirability of establishing these reserves, and under date of October 25, 1915, an order was issued, to be effective January 1, 1916, forbidding all fishing for salmon or other fishing in the prosecution of which salmon are taken or injured in the waters described as follows:

1. All waters tributary to Barnes Lake, Prince of Wales Island.
2. Hetta Creek, its tributary waters, and the region within 500 yards of the mouth of said creek.
3. Sockeye Creek, its tributary Boca de Quadra hatchery waters, and the region within 500 yards of the mouth of said creek.

In addition to the waters affected by the order of October 25, 1915, there are, as a result of previous orders of the Secretary of Commerce, special limitations upon commercial fishing within the following described waters: Wood and Nushagak Rivers in western Alaska; in central Alaska all streams flowing into Cook Inlet, Eyak Lake, and a limitation on fishing in Eyak River; and in southeast Alaska, Anan

Creek and Naha Stream. In addition, fishing limitations by authority of Executive order and proclamation apply to waters of the following: Afognak Reservation, Aleutian Islands Reservation, and Yes Bay and Stream.

In the summer of 1914 it was brought to the attention of the Bureau that there was a lack of definite agreement as to the mouth of the Kenai River, a tributary of Cook Inlet, in reference to the requirements of the department's order of November 18, 1912, limiting fishing in streams flowing into Cook Inlet. The matter was taken up with the Coast and Geodetic Survey, and in the spring of 1915 instructions were issued to a field agent to establish markers to designate the mouth of the river. When the work was done it was found that five fish traps had been located within the prohibited area.

PATROL BOATS.

During the active fishing season as adequate a patrol of the fishing grounds was maintained as the funds of the Bureau permitted. Most of this work was in southeast Alaska, where the applicability of the weekly close season, the extensive fishing grounds, the use of practically all kinds of fishing gear, the network of channels, streams, and open waters, and the keen competition for fish, all combine toward the need of special activity by the Government. To meet requirements along this line, the Bureau's steamer *Osprey* (23 tons) was used throughout the season, and the power boats *Standard* (15 tons) and *Iowa* (8 tons) were chartered for use in July and August. Other vessels were hired for short periods as circumstances required. In central Alaska a number of vessels were hired for brief periods, one being employed for most of July.

Approximately the sum of $5,000 was spent for patrol work in the several sections of Alaska, and it is estimated that more than 10,000 miles were covered by boats engaged in this service in the year 1915. Of this the steamer *Osprey* logged 4,934 nautical miles. The heaviest periods of steaming occurred in the months of July, August, and September, during the time of active fishing for salmon.

This opportunity is taken to reiterate the thought expressed in previous reports in regard to the pressing need for additional vessels for patrol work. At least six seaworthy boats are required—three for southeast Alaska, two for central Alaska, and one for the western district. This would meet only minimum requirements. Under present conditions it is occasionally absolutely necessary for some of the Bureau's wardens to accept transportation upon boats owned by fishing companies whose operations are being inspected at the time. This is entirely wrong in principle, and can be remedied only when additional funds are provided for an adequate vessel service.

VIOLATIONS OF LAWS AND REGULATIONS.

The enforcement of the laws and regulations for the protection of the fisheries constitutes no inconsiderable part of the Bureau's duties in Alaska. The importance of this work, as in the case of similar activities elsewhere, is obvious; for it is only as there is observance of the law that beneficial results in the proper conservation and development of the great natural wealth of the fisheries may be realized. The law is not intended to stifle legitimate enterprise nor to cause oppressive hardship, as might be inferred from the attitude of some of those who, because of their acts, either willful or otherwise, feel its force. On the contrary, it is intended to benefit directly and indiscriminately all who are concerned with it, which in this case is first in respect to those who are engaged in the business of taking fish and preparing them for market. Comparing the present-day situation with that which existed only a few years ago, it is undoubtedly true that there is now a more earnest purpose to comply with both the spirit and the letter of the fishery laws in Alaska. But, as the result chiefly of keen competition and confirmed cupidity, manifested in certain directions, more often by irresponsible employees, the necessity of never-ending vigil in enforcing the law rests as a constant duty upon the Government. It may be said, happily, that either as a result of closer supervision and improved efficiency in enforcing the law or because of a better disposition to observe the law, there have been but comparatively few violations of the fishery laws reported in Alaska this year. This is indicated by the outline which follows of the cases that have received attention.

On Sunday, August 8, 1915, William Strand, of Haines, was found operating a gill net at one of the Chilkat Islands. The case was tried in the United States commissioner's court at Juneau on August 26. The defendant pleaded hunger as the reason for fishing on Sunday and the jury returned a verdict of not guilty.

The charge against the Irving Packing Co. for having had a fish trap in operation on Sunday, June 28, 1914, was presented to the grand jury at Juneau in January, 1915, and a true bill was returned. On February 15, 1915, a representative of the company appeared in answer to the summons. It was then found that the indictment was in error in charging the offenders to be a corporation, whereas they were only a copartnership. To settle the matter promptly, the United States attorney filed a complaint in the United States commissioner's court, and the representative of the firm pleading guilty, a fine of $50 was imposed.

A complaint was made by Frank Dandey, charging an Indian crew with laying a net illegally across Sarkar Cove, west coast of Prince of Wales Island. The case was tried in the United States commissioner's court at Craig on August 4, 1915. The defendants denied the charge, and, evidence in their favor being adduced, they were discharged.

The Thlinket Packing Co. appealed the case decided against it at Juneau in the fall of 1914 for not closing certain fish traps in accordance with the weekly close period requirement of law. The appeal is still pending.

The cases against Libby, McNeill & Libby, based upon the indictments charging them with the wanton waste of salmon at a trap operated at Tyonek in connection with their cannery at Kenai on July 15 to 20, 1914, were brought to trial at Valdez in September, 1915. It was established at the trial that the company had furnished the wire and cotton webbing for a trap to two fishermen who alleged that they knew of a good trap site. These men furnished the piling. Through part of the season the company took the fish caught by the trap, but later on did not need any fish from it. Thereafter the alleged waste of salmon took place. One of the most important questions of the case was the ownership of the trap. The defendants represented that the material had been furnished to the fishermen without cost and none of it was returned save a few tools used in its construction. They disclaimed wholly any interest in the ownership or management of the trap and claimed they had agreed to take only the king salmon, and that they had faithfully performed their part of the contract. The jury deliberated 16 hours and returned a verdict of not guilty.

An indictment against the Northwestern Fisheries Co. charged it with the wanton waste of salmon at its Salamatof Point trap. The case was brought to trial at Valdez on September 18, 1915. The evidence was purely circumstantial and no witnesses were introduced by the defendant. The jury returned a verdict of not guilty. Another indictment against this company charged it with having wantonly wasted halibut, skates, cod, and other fishes. The case was brought to trial at Valdez, September 20, 1915. While there was no denial that such fishes in small quantities had been lost, the Government failed to show that there had been wanton waste and for that reason the jury was instructed to find the defendant not guilty, on the ground that wanton waste had not resulted if the company in fishing for salmon had taken other fishes that were not wanted and could not be separated from the salmon without rendering the business unprofitable. A third indictment against the company charged it with the wanton waste of some 60,000 herring. The United States attorney moved a dismissal of the case and the motion was granted.

The cases arising from the indictments filed in the United States district court at Valdez in 1914 charging the Alaska Packers Association with wanton waste of salmon on Cook Inlet are set for trial in the fall of 1916. A motion for a continuance of these cases was granted when the matter came up in the fall of 1915.

The Fidalgo Island Packing Co. pleaded guilty to the charge against it of having wantonly wasted food fishes in connection with the operation of its cannery at Port Graham. A fine of $500 was paid by this company.

Indictments were returned by the grand jury at Valdez in September, 1915, charging Libby, McNeill & Libby with having wantonly wasted fish at their Point Possession trap no. 8 and the Deep Sea Salmon Co. with having wantonly wasted fish at its Moose Point trap no. 4, at some independent traps, and by gill-nets fishing for the company.

In the main the fisheries laws and regulations were well observed in the Bristol Bay region. The cannerymen expected that there would be a very poor run and were undoubtedly anxious to pack all the fish possible. There were indications of some waste of chum salmon, but evidence could not be obtained as to who were responsible. Two nets were seized by a warden patrolling the closed waters of Wood and Nushagak Rivers, but as the owners of the nets could not be found no complaints were filed. The nets were tied across the mouths of two small streams tributary to the Nushagak River.

A complaint was made by residents of Olness in regard to a fish trap in the Chatanika River. An investigation by Warden C. F. Townsend disclosed that a fish trap had been placed in the river for the purpose of taking whitefish. At the time the trap was constructed the water was high and the trap extended only about one-third of the way across the stream. After the water became low, however, the trap extended entirely across the stream. When Mr. Townsend arrived on the ground ice had destroyed the main body of the trap. The owners having been notified in regard to the requirements of the law, the matter was dropped in accordance with the advice of the United States attorney.

A complaint was made by Warden W. P. Hemenway against Alec Simpson, Ben Cutler, and Fred Douse for having wantonly wasted fish at Birch Lake on August 8, 1915. The defendants appeared in the United States commissioner's court at Fairbanks, September 1, 1915, without service of a warrant, and entered a plea of guilty. The court imposed a fine of $1 each and costs. It was estimated that the waste involved about 600 pounds of pickerel.

ALASKA LEGISLATIVE NOTES.

In the act of August 24, 1912, creating a Territorial form of government for Alaska, it was provided that the legislature should not have the power to alter, amend, modify, or repeal existing laws in respect to the fisheries of the Territory. A proviso was incorporated, however, which stated that nothing should prevent the Territory from imposing other and additional license fees or taxes. Pursuant to the authority which was supposed to exist by virtue of this proviso, the Territorial Legislature, at its first session, which occurred in 1913, imposed certain license fees on the fisheries. This act was reenacted by the legislature at its second session, in 1915, the following being that part referring particularly to the fisheries:

> SECTION 1. That any firm, person or corporation prosecuting or attempting to prosecute any of the following lines of business in the Territory of Alaska shall apply for and obtain a license and pay for said license for the respective lines of business as follows:
>
> * * * * * * *
>
> 6th. Fisheries: Salmon canneries, four cents per case on king and reds or sockeye; two cents per case on medium reds; one cent per case on all others.
>
> 7th. Salteries: Two and one-half cents per one hundred pounds on all fish salted or mild cured, except herring.
>
> 8th. Fish traps: Fixed or floating, one hundred dollars per annum. So-called dummy traps included.
>
> 9th. Gill nets: One dollar per hundred fathoms or fraction thereof.
>
> 10th. Cold-storage fish plants: Doing a business of one hundred thousand dollars per annum or more, five hundred dollars per annum; doing a business of seventy-five thousand dollars per annum, and less than one hundred thousand dollars, three hundred and seventy-five dollars per annum; doing a business of fifty thousand and less than seventy-five thousand dollars per annum, two hundred and fifty dollars per annum; doing a business of twenty-five thousand and less than fifty thousand dollars per annum, one hundred and twenty-five dollars per annum; doing a business of ten thousand dollars and less than twenty-five thousand dollars per annum, fifty dollars per annum; doing a business of four thousand, and less than ten thousand dollars per annum, twenty-five dollars per annum; doing a business of under four thousand dollars per annum, ten dollars per annum. The "Annual Business" under this section shall be considered the amount paid per annum for the product.

It has been felt by the commercial fishery interests of Alaska that the enabling act did not confer sufficient authority upon the Territorial Legislature to impose any license fees or taxes upon the fisheries. As a result, there has been much controversy, and the license fees or taxes collected by the Territory have been paid under protest by the companies concerned. It was finally agreed upon by representatives of the fishery interests and the Territory that a test case would be instituted with a view to having the matter definitely decided by the courts. Accordingly, a case was brought to trial in the district court at Juneau, the Alaska Salmon Co., operating a cannery in western Alaska and with headquarters at San Francisco, being named as defendant. In December, 1915, the district court rendered a decision in favor of the Territory of Alaska, and the case was accordingly appealed to the circuit court of appeals of the ninth judicial district. No decision has been handed down as yet by that court. It is understood that the representatives of the fishery interests and the Territory bound themselves to abide by the decision of the circuit court without attempt at further appeal.

WOOD RIVER CENSUS.

A census of red salmon entering Wood River (Lake Aleknagik) to spawn was again taken in 1915. This work was begun in 1908 and has been continued each year since with the exception of 1914.

The winter of 1914-15 was unusually mild in the Nushagak region, and it was reported that the ice left the rivers in March and April. The spring was also exceptionally mild, there was practically no rain, and the days were extremely warm throughout the season. An early run of salmon was, therefore, expected and arrangements were accordingly made to have the Wood River rack put in place as early as possible. This was accomplished the early part of June. The counting of salmon extended from June 14 to August 2, both dates inclusive. The run reached its maximum on July 7, when 26,901 fish were counted. The next largest count, 25,554 fish, was made on July 12.

The following statement shows the tally of salmon at the Wood River (Lake Aleknagik) rack in 1915:

	Number.		Number.		Number
June 14..........	161	July 2...........	14,241	July 20..........	1,834
June 15..........	475	July 3...........	6,799	July 21..........	1,449
June 16..........	706	July 4...........	5,701	July 22..........	778
June 17..........	727	July 5...........	1,977	July 23..........	1,006
June 18..........	2,277	July 6...........	8,524	July 24..........	1,785
June 19..........	1,090	July 7...........	26,901	July 25..........	1,957
June 20..........	606	July 8...........	21,297	July 26..........	1,374
June 21..........	481	July 9...........	15,335	July 27..........	762
June 22..........	1,016	July 10..........	8,295	July 28..........	635
June 23..........	2,375	July 11..........	19,832	July 29..........	518
June 24..........	2,810	July 12..........	25,554	July 30..........	209
June 25..........	1,732	July 13..........	14,185	July 31..........	180
June 26..........	1,418	July 14..........	7,014	Aug. 1..........	120
June 27..........	604	July 15..........	5,839	Aug. 2..........	70
June 28..........	738	July 16..........	9,951		
June 29..........	1,144	July 17..........	12,101	Total.....	259,341
June 30..........	6,014	July 18..........	5,223		
July 1...........	11,061	July 19..........	2,460		

A few salmon of other species enter the river with the red salmon, but the number is too small to affect materially the results of the count. It was estimated that 18 per cent of the fish passing through the rack had been injured by gill nets and that at least 90 per cent of the injured fish died before spawning. Fish injured by gill nets were present throughout the entire run. Counts made at different times to determine the relative proportion of such fish gave widely varying results. Ordinarily the number of gill-netted fish ranged between 12 and 26 to the hundred. Several counts were made in which there were from 30 to 42 in a hundred. On the other hand, one count was made in which there were only 2 injured fish in a total of 1,103.

Valuable assistance was rendered the Bureau by the Alaska Packers Association and the Alaska-Portland Packers' Association in connection with the census work.

ALEUTIAN ISLANDS RESERVATION.

The Aleutian Islands Reservation was created by an Executive order of March 3, 1913. It embraces all islands of the Aleutian chain, including Unimak and Sannak Islands on the east, and extending to and including Attu Island on the west. By the terms of the Executive order the islands within the reservation are reserved and set apart as a preserve and breeding ground for native birds, for the propagation of reindeer and fur-bearing animals, and for the encouragement and development of the fisheries. Provision is made that the establishment of the reservation shall not interfere with the use of the islands for lighthouse, military, or naval purposes, or with the extension of the work of the Bureau of Education on Unalaska and Atka Islands. Jurisdiction in respect to the reservation was placed with the Departments of Agriculture and Commerce.* The joint regulations, effective March 15, 1914, promulgated by the two departments, are still operative. They are as follows:

1. In compliance with existing laws and to carry out the objects of the Executive order establishing the reservation, all matters relating to wild birds and game and the propagation of reindeer and fur-bearing animals will be under the immediate jurisdiction of the Department of Agriculture; all matters pertaining specifically to the fisheries and all aquatic life, and to the killing of fur-bearing animals, will be under the immediate jurisdiction of the Department of Commerce; and all matters other than those specifically mentioned above will be under the joint jurisdiction of the Departments of Agriculture and Commerce.

2. Persons residing within the limits of the reservation on March 3, 1913, will be permitted to continue to so reside, and to carry on any lawful business not interfering with the purposes of the reservation.

3. Residents of the reservation desiring to engage in commercial fishing, or the hunting, trapping, or propagation of fur-bearing animals or game animals, must first secure a permit to do so.

4. Anyone desiring to enter the reservation for the purpose of fishing, hunting, trapping or propagating fur-bearing animals or game animals, or engaging in commercial fishing, salmon canning, salmon salting, or otherwise curing or utilizing fish or other aquatic products, or for the purpose of engaging in any lawful business, must first obtain a permit to do so.

5. Whenever, in the propagation of fur-bearing animals, it shall be found to be necessary to kill such of these animals as interfere with the work of the Department of Agriculture in this behalf, they may be killed under the supervision of said department, and no permit will be required therefor.

6. *Fishery permits.*—Application for permission to engage in fishing or fishery operations should give full information on the following points: Name and permanent address of the person or company desiring the permit; character of business proposed, whether fishing, canning, salting, or otherwise curing fish or other aquatic products; character and extent of proposed plant and its location; method and extent of the fishing proposed, place or places where fishing is to be carried on, and when active operations are to begin.

7. *Trapping and hunting permits.*—Applications for permission to engage in trapping, hunting, or propagating fur-bearing animals or game animals should give the name of the person desiring the permit and the island or islands on which it is proposed to operate. At present no permits will be issued for trapping or hunting fur-bearing animals except to natives of the reservation.

8. *Permits to ship live foxes from the reservation.*—For the present no permits will be issued for capture and shipment of live foxes from the reservation, except domestic stock from established fox farms.

9. Permits to enter the reservation for the purpose of engaging in any business will be granted only when the department concerned is convinced that, by so doing, the objects for which the reservation was established will not be endangered thereby.

10. *Collecting permits.*—Permits to enter the reservation for the purpose of collecting birds, mammals, or other natural-history specimens for scientific purposes will be granted only to properly accredited representatives of the United States Government or agents of public museums.

11. *Reindeer and caribou.*—The killing of reindeer and caribou on any of the islands of the reservation is hereby prohibited except under special permit.

It will be noted that section 3 of the regulations provides that residents of the reservation desiring to engage in commercial fishing must first secure a permit to do so. Natives of the reservation catch salmon, cod, herring, and other fishes for their own use, and it has been their custom to sell a few fish to the white residents and to vessels stopping within the reservation. This affords the natives an opportunity to improve their condition, and it is not the intention of the Bureau at present to require that permits be secured to cover the operations of natives, residents of the reservation, who, in addition to taking fish for their own domestic purposes, take fish for sale locally, that is, within the reservation, and in limited quantities.

In December, 1914, a permit, expiring December 31, 1915, was issued to A. C. Goss, of Unalaska, authorizing him to take Atka mackerel in the vicinity of Attu Island and red salmon in the vicinities of Umnak and Unalaska Islands. It was stipulated that all work in connection with the taking of the fish and their subsequent preparation for market should be performed by Aleuts or Indians who were residents of the reservation.

A brief account of the work which Mr. Goss did in connection with Atka mackerel is given on page 67.

In March, 1915, a permit was issued authorizing A. B. Somerville, of Unalaska, to take red salmon in the vicinity of Attu Island. The same requirement was made in regard to the employment of native labor as was made in Mr. Goss's permit. The permit was subsequently extended to include mackerel.

AFOGNAK RESERVATION.

Fishing operations within the Afognak Reservation during the season of 1915 were under the general supervision of Assistant Agent E. M. Ball. The details of the work were attended to in large measure by his assistant, Warden James H. Lyman.

Supplementing the general regulations of the Department of Commerce in respect to fishery operations within the reservation a number of additional rules were put in force. Fishing at Malina was closed from 6 p. m. Saturday, June 26, to 6 a. m. Thursday, July 1; at Paramanof from 6 p. m. Saturday, July 10, to 6 a. m. Thursday, July 15. Litnik Bay and all that portion of Seal Bay locally known as Pauls Bay were closed throughout the season. Fishing gear was limited to seines and gill nets not exceeding 200 fathoms in length. Fishermen were required to keep the mouths of streams clear of all dories, skiffs, and other gear which would in any way tend to prevent the ascent of salmon to the spawning grounds, and they were directed to pew fish through the head only.

For the season 79 licenses were issued authorizing commercial fishing. The Kadiak Fisheries Co., of Kodiak, was the only company to secure fish taken, through arrangements with the licensees. Late in May this company selected crews from such men as were entitled to fish, fitted them out with gear, and transported them to the various field stations. In July and August when the fishing was at its height there were 14 crews engaged in the work. In the course of the season 6 localities were fished.

The largest runs of sockeyes occurred at Malina in June and July. Seal Bay ranked second, with times of runs the same. Many red salmon, particularly at Malina, were prevented from entering their spawning grounds because of low water due to drought which threatened to dry up the streams. The fish returned to the ocean after making futile attempts to reach their spawning grounds, and when rain came in August swelling the streams they did not make a second appearance. Humpback salmon were taken quite generally in the waters of the reservation, Izhut and Paramanof Bays being most prolific. In August and September there was an unusual run of cohos. It was said that they were more numerous than at any other time since the eruption of Mount Katmai in 1912, which inflicted severe damage on the fish life in this reservation.

The catch of salmon in the commercial fisheries of Afognak waters for 1915 is shown, by localities and species, in the following table:

CATCH OF SALMON IN THE AFOGNAK RESERVATION, SEASON OF 1915.[a]

Localities.	Sockeyes.	Humpbacks.	Cohos.	Total.
Malina	38,298	1,431	....	39,729
Paramanof	15,028	9,102	....	24,130
Seal Bay	26,002	8,363	59	34,424
Little Afognak	10,702	5,393	5,876	21,971
Izhut Bay	1,216	9,130	....	10,346
Danger Bay	14	4,075	3	4,092
Total	91,260	37,494	5,938	134,692

[a] Through inadvertence there were included in the corresponding table in the report for 1914 (Bureau of Fisheries document no. 819), 5 localities, viz, Eagle Harbor, English Bay, Kaluda, Kizhuyak, and Shuyak Island, which are not in the Afognak Reservation.

A detailed statement of the methods of capture of each species and the approximate beginning and ending of the fishing season in each locality is shown in the table following:

FISHING SEASON, APPROXIMATE, AND APPARATUS, AFOGNAK RESERVATION, 1915.[a]

Localities.	Sockeyes.		Humpbacks, seined.	Cohos, seined.	Fishing season.	
	Gilled.	Seined.			Began.	Ended.
Malina	....	38,298	1,421	....	May 29	Aug. 21
Paramanof	4,417	10,611	9,102	....	June 2	Aug. 5
Seal Bay	8,040	17,962	8,283	59	June 1	July 21
Little Afognak	....	10,702	5,393	5,876	June 16	July 12
Izhut Bay	....	1,216	9,120	....	July 15	Aug. 14
Danger Bay	....	14	4,075	3	July 20	Aug. 25
Total	12,457	78,803	37,494	5,938		

[a] Through inadvertence there were included in the corresponding table in the report for 1914 (Bureau of Fisheries document no. 819), 5 localities, viz, Eagle Harbor, English Bay, Kaluda, Kiznuyak, and Shuyak Island, which are not in the Afognak Reservation.

At the prevailing rates paid for salmon the catch was worth about $4,223.

COMPLAINTS BY NATIVES.

COPPER RIVER.

A report was made in 1915 by the United States commissioner at Chitina that the Copper River Indians were unable to obtain a supply of salmon for their winter needs, and it was requested that the matter be given early consideration. An investigation of the situation covering the region from Chitina northward was made by Assistant Agent Ball in the fall of 1915 and continued by Warden Lyman in the winter of 1915–16. It was thought that by continuing the investigation into the winter season the condition of the natives, so far as it was affected by their supply of fish, could be ascertained from actual observation at that time.

The Copper River Valley from Chitina northward has a native population of about 300 persons, located principally at Copper Center, Chitina, Upper Tonsina, Lower Tonsina, Gulkana, Gakona, and Mentasta. There are a few scattered groups elsewhere. Information in regard to the situation was obtained not only from the natives themselves but from proprietors of road houses, trappers, fox ranchers, and settlers. Arthur H. Miller, agent of the Bureau of Education at Copper Center, rendered assistance in the collecting of information from the natives.

No actual suffering on the part of the natives on account of the lack of a supply of fish was observed. Evidence as to the maintenance of the usual supply of fish in the waters of this region in the season of 1915 was conflicting. It is believed, however, that the present supply is somewhat less than it was years ago, but it further appears that the natives are concerned not so much with the present supply as with the prospects of what the future has in store for them. Moreover, at present, caribou, moose, and mountain sheep are plentiful in localities and a supply of food secured from these animals may be substituted in part.

In general it may be said that the same conditions are found here that obtain in some other regions in Alaska. The natives will not be able to compete with modern methods if they continue to adhere to their primitive methods of fishing and to their original customs and attitude of indifference toward continued and persistent effort and industry. To limit modern fishing operations to an extent that a supply of fish may be available in such places as individuals may desire, and in such quantities as will enable natives to take their year's supply within such limited periods as natural inclination would dictate, would mean a loss of food to the world at large that would not be justified.

ENGLISH BAY.

In June, 1915, the Department of Commerce received a communication from the Department of the Interior advising of the receipt by that department of a communication from natives of English Bay, Alaska, stating that the placing of a fish trap by the Seldovia Salmon Co. in front of the native village of English Bay had made it impossible for them to get fish enough for their support during the winter, and setting forth their circumstances and needs. Orders were immediately issued to an agent of the Bureau to determine whether the trap in question was legally placed and to ascertain other pertinent facts.

The investigation made accordingly developed that the trap was not unlawfully placed. The trap site had been located a number of years previously and in the meantime the propriety of operating the trap in that place had not been disputed. It was found, however, that the natives were daily violating the law by seining and setting gill nets within 100 yards outside the mouth of the red-salmon stream flowing into English Bay.

Considering in a general way the dependence of the natives of Alaska upon the fisheries, something should be said in their favor. Where modern methods of fishing prevail, the natives are sometimes unable to compete successfully for their supply of fish or to adapt themselves to the changed conditions. Possibly the establishment of a number of fishery reserves for their exclusive use would be the best solution of the problem. A general policy of this character should not be undertaken except in accordance with well-formulated plans equitable to all interests involved and with false sentiment for the natives eliminated.

SALMON HATCHERIES.

EXTENT OF OPERATIONS.

In 1915 seven salmon hatcheries were operated in Alaska, two of which were Government stations and five were private hatcheries. In addition three small field or collecting stations were operated for short periods by the Government, one of these being in conjunction with the Yes Bay hatchery, and the other two subsidiary to the Afognak hatchery. The aggregate annual capacity of the seven hatcheries is approximately 350,000,000 red-salmon eggs, of which the two Government stations are capable of handling nearly 150-000,000.

In 1914 the total take of red, or sockeye, salmon eggs in Alaska was 133,984,500, from which a total of 121,784,330 young salmon were liberated, chiefly during the spring of 1915. In addition there was a shipment of 3,000,000 eggs to Oregon. This represents an increase over the previous season, when 119,668,680 red salmon were liberated in Alaska waters. The take of red-salmon eggs in 1915 totaled 173,499,100, or an increase of about 40,000,000 over the take in the fall of 1914. This gain was chiefly at the Bureau's station at Yes Bay. In 1915 the collection of humpback eggs aggregated 16,976,000 as compared with 19,108,000 in 1914, or nearly 2,000,000 less.

OPERATIONS OF ALASKA HATCHERIES IN 1915.

Stations.	Red or sockeye salmon eggs taken in 1914.	Red or sockeye salmon liberated in 1914–15.	Red or sockeye salmon eggs taken in 1915.
Yes Bay	41,300,000	36,720,000	[a] 72,000,000
Afognak	7,390,000	5,444,830	[b] 8,183,000
Uganik			[c] 2,685,000
Seal Bay			[d] 3,232,100
Fortmann (Naha)	22,500,000	20,820,000	[e] 26,520,000
Karluk	30,240,000	27,704,000	41,135,000
Quadra	21,300,000	20,300,000	7,500,000
Hetta	7,438,500	7,142,500	8,114,000
Klawak	3,816,000	3,653,000	4,130,000
Total	133,984,500	121,784,330	173,499,100

[a] Also 325,000 humpback eggs collected at Ketchikan and planted before hatching.

[b] A collection of 12,355,000 humpback eggs also made.

[c] A collection of 2,461,000 humpback eggs also made. All eyed eggs, both red and humpback, transferred to Afognak.

[d] A collection of 1,235,000 humpback eggs also made. All eyed eggs, both red and humpback, transferred to Afognak.

[e] A collection of 600,000 humpback eggs also made.

NOTE.—Of the Yes Bay collections of sockeye eggs, shipments of 3,000,000 were made in the fall of 1914, and the same number again in October, 1915, to the Oregon Fish Commission. Also in the fall of 1915 a shipment of 100,000 was made to the Bureau's station at Quinault Lake, Wash., and 15,000,000 were transferred to Afognak.

HATCHERY REBATES.

Under the terms of existing law those who operate private hatcheries in Alaska are allowed a rebate of 40 cents for every thousand red or king salmon fry released. This sum is the equivalent of the tax on

10 cases of canned salmon. The plan of operating private hatcheries is not looked upon with favor at the present time, and it is hoped that in the near future legislation will be enacted to the end that they may be taken over by the Government.

Pursuant to law, affidavit is made by the operators of private salmon hatcheries showing the number of fry released during each year ending June 30. The following table shows the rebate certificates due for the year ended June 30, 1915:

OUTPUT OF SALMON FRY FROM PRIVATE HATCHERIES DURING FISCAL YEAR ENDED JUNE 30, 1915.[a]

Owners.	Location.	Red-salmon fry liberated.	Rebate due.
Alaska Packers Association	Naha Stream	20,820,000	$8,328.00
Do	Karluk River	27,704,000	11,081.60
Northwestern Fisheries Co	Quadra Lake	20,300,000	8,120.00
Do	Hetta Lake	7,142,500	2,857.00
North Pacific Trading & Packing Co	Klawak Lake	3,653,000	1,461.20
Total		79,619,500	31,847.80

[a] In the case of the hatcheries where the seasonal distribution of fry is not completed before July 1, the remaining fry are shown in the subsequent fiscal year's report.

HATCHERY INSPECTION.

At various times during the year 1915 the several private salmon hatcheries in Alaska were inspected by representatives of the Bureau of Fisheries. The purpose of these inspections is to determine the number of eggs taken and the number of young salmon liberated. Due note is made as to the methods of operation. Care is taken to check up the records of the hatchery in order to determine the correctness of returns covering the output.

YES BAY.

From the 41,300,000 red-salmon eggs taken in 1914 at the Bureau's station at Yes Bay, 36,720,000 young fish were liberated in the period from January to July, 1915. Of this collection there was also a shipment of 3,000,000 eyed eggs to the Oregon Fish Commission in October, 1914. Thus the losses were 1,580,000, or 3.8 per cent.

In 1915 the taking of red-salmon eggs at Yes Bay began September 2 and ended September 29, when the hatchery was filled to its capacity of 72,000,000 eggs. In October 3,000,000 of these eggs were transferred to the Oregon Fish Commission and 100,000 were shipped to the Bureau's station at Quinault Lake, Wash., while in November 15,000,000 eggs were transferred to the Afognak station.

Arrangements were made to operate a substation in rented quarters at Ketchikan for the collection of humpback-salmon eggs from fish ascending Ketchikan Creek. A take of 325,000 eggs had been made in the period from September 8 to 16, 1915, when operations were discontinued at the request of citizens of Ketchikan, and the eggs were planted upon the natural spawning grounds. In 1913 a substation was operated at Ketchikan, but in 1914 no eggs were obtained, as there was no run of salmon in the creek.

Realizing the advantages of planting fingerlings rather than fry, the Bureau has increased its efforts to feed as many of the young salmon at Yes Bay as possible before liberating them. Three rearing ponds, each 12 by 60 feet in size and 2½ feet in depth, constructed in 1914, were utilized for this purpose in 1915. Eighty troughs in the hatchery were also used for feeding young salmon. The food consisted of steelhead trout that were obtained near the hatchery and adult salmon which had been salted down after their eggs were taken the previous fall. These salmon were thoroughly freshened by being placed in running water for 24 hours or more. The food was cooked, ground, pressed dry, and after grating and screening was ready to be fed. It appeared to give satisfactory results. Some difficulty was experienced with the salmon held in the ponds when the water warmed up to an unusual degree in the month of June. Most of the fingerlings then remaining on hand were accordingly planted in the lake.

A watchman was stationed on Yes Bay, beginning July 13, 1915, and continuing through the run of the red salmon, to see that the order closing the bay to commercial fishing was fully observed.

AFOGNAK.

The collection of red-salmon eggs at the Afognak station from August 1 to September 29, 1914, aggregated 7,390,000. From these eggs there was planted in the period from December, 1914, to May, 1915, a total of 5,444,830 young salmon, most of which were of the fingerling size. The take of red-salmon eggs at this station in 1915 continued from August 7 to September 30, during which time 8,183,000 eggs were obtained.

A shipment of 15,000,000 red-salmon eggs in 65 cases from the Yes Bay station arrived at Afognak village December 9 and was placed in the Bureau's warehouse at Litnik Bay. On account of unfavorable weather and great difficulties in transporting the egg cases over the ice, it was not until December 22 that the last of the eggs reached the hatchery. Although made ready for shipment at Yes Bay on November 23, these eggs were in good condition with the exception of one case in which there had been some premature hatching.

From August 4 to September 14, 1914, there were taken at Afognak 6,574,600 humpback-salmon eggs. From these eggs 119,480 young salmon were planted in the winter and spring of 1914–15. Most of the eggs from this collection went with the 2,534,000 collected from

August 26 to September 5 at Uganik and the 5,000,000 purchased from the Karluk hatchery of the Alaska Packers Association, to make up the total of 12,500,000 humpback-salmon eggs shipped in November, 1914, of which 7,000,000 were consigned to Government hatcheries in Maine and the balance to stations of the Bureau in Washington.

The taking of humpback eggs at Afognak in 1915 extended from August 2 to September 21, the total collection being 12,355,000.

Nearly all the young salmon handled at the Afognak station were fed for some time before being planted. Several tons of Dolly Varden trout and spawned salmon had been salted down the previous season to be used for this purpose. In preparing the food the fish were freshened, cooked, pressed into a cake and left under pressure until cold; then the food was cut into strips, which were run through a fine meat grinder several times and finally through a fine screen. The young salmon did very well on this diet. The construction of a series of 12 rearing ponds, each 20 feet long, 6 feet wide, and 3 feet deep, is under way. When these ponds are completed it is anticipated that they will be of great assistance in holding and feeding young salmon. The ponds are being so built that additional ones can be constructed just below them, if necessary.

Fish-cultural operations in this region are still greatly handicapped on account of the volcanic ash resulting from the eruption of Mount Katmai in 1912.

UGANIK.

The total collections at this point in 1915 were 2,685,000 red and 2,461,000 humpback salmon eggs. The loss was 85,000 red and 61,000 humpbacks; the balance, 2,600,000 red and 2,400,000 eyed humpback eggs, was transferred to the Afognak hatchery. The Uganik field station was closed October 9.

SEAL BAY.

A new collecting and field station was established at Seal Bay on the northeast coast of Afognak Island. Some of the equipment used here was transferred from the field station operated in 1913 at Eagle Lake. Preparations for work at Seal Bay were begun in June and operations were brought to a close on October 13, 1915. Collections totaled 3,232,100 red and 1,235,000 humpback salmon eggs. The loss was 59,100 red and 111,200 humpbacks, thus leaving 3,173,000 red and 1,123,800 humpback eggs, all eyed, which were transferred to the Afognak hatchery.

FORTMANN.

The Fortmann hatchery is the largest salmon propagating station in the world, its capacity being approximately 110,000,000 red-salmon eggs. It is operated by the Alaska Packers Association and is located on Heckman Lake about 8 miles from Loring, Alaska. The egg-taking season in 1914 extended from August 22 to November 30, during which period 22,500,000 red-salmon eggs were secured. The number of young fish liberated therefrom in 1915 was 20,820,000, the loss thus being 1,680,000, or 7.4 per cent. The fry from the hatchery were transferred to nursery ponds where they were fed, following which they were liberated in the Naha Stream system, of which Heckman Lake forms a part. A few fry were planted in some of the small streams tributary to the lake; it was thought that they would acquire sufficient growth in such protected waters to enable them to care for themselves better before becoming subject to the attacks of birds and larger fishes in the more open waters of the lake. This would be a good plan to follow at other salmon hatcheries in Alaska where there are not ample facilities for rearing to the fingerling size before planting.

In 1915 the egg-collecting season continued from August 21 to November 20, during which time the take of red-salmon eggs was 26,520,000. The average number of eggs per female spawned is reported as 2,605. The earliest take of eggs began to hatch on November 9. From the records of the hatchery it has been determined that the period of eyeing in an average water temperature of 49° F. is 31 days, and with an average temperature of 46° F. is 41 days. With an average temperature of 46° F. the period of hatching is 82 days.

From August 22 to November 22, 1915, 600,000 humpback-salmon eggs were taken experimentally. In connection with the taking of humpback eggs at this hatchery the following is extracted from a communication of December 10, 1915, from the Alaska Packers Association:

> It may be of interest to know that at our Fortmann hatchery, located on Heckman Lake, there are practically no humpbacks. In 1913 about 5,000 humpback eggs were taken from fish collected on Jordan Lake (next below Heckman Lake) and the fry resulting therefrom liberated from the hatchery. This year 119 salmon of this species were caught off the hatchery fishing grounds. It would appear that these results add to the theory derived from the study of the ages of salmon by scale markings, that humpback salmon are 2 years old at the time of spawning.

The foregoing opinion of the Alaska Packers Association is corroborative of investigations elsewhere, which seem to establish quite conclusively that the humpback salmon is a 2-year-old fish when it returns from the sea.

The eggs are not taken at this station by the method of incision, nor are the fish killed before they are stripped. This results in a loss of some eggs, for by the more modern practice of incision it is possible to obtain practically all ripe eggs. An examination of some of the salmon at Fortmann hatchery in 1915 showed that in various portions of the body cavity as many as 100 eggs were found. At least, part of these eggs would have been saved if they had been taken by the method of incision.

KARLUK.

The Karluk hatchery is operated by the Alaska Packers Association. It is located about 2 miles up the Karluk River on Kodiak Island, in central Alaska, and has a capacity of upward of 50,000,000 red-salmon eggs. The egg-collecting season of 1914 extended from June 27 to September 30, and resulted in a take of 30,240,000 red-salmon eggs, from which it was reported that there were liberated in 1914, 27,704,000 young fish. The loss of 2,536,000 was 8.3 per cent of the total. The fry were liberated in nursery ponds, where they were held a short time and fed, after which they were planted in the Karluk River.

The egg-collecting season of 1915 extended from June 26 to September 29, during which time 41,135,000 eggs were obtained. It is reported that the average number of eggs per female spawned was 2,620. Of the 8,050,000 humpback eggs taken from August 24 to September 8, 1914, 5,000,000 eyed eggs were sold to the Bureau of Fisheries, and from the remaining eggs 1,049,610 fry were liberated.

The eyed eggs purchased by the Bureau were transferred to the Afognak hatchery where they were included in a shipment of eggs the greater part of which was sent to Maine, where an effort is being made to establish a run of Pacific salmon in Atlantic waters.

QUADRA.

The Quadra hatchery is owned by the Northwestern Fisheries Co., and is located at Quadra in southeastern Alaska. It has a capacity of about 21,000,000 red-salmon eggs. The season of 1915 at this hatchery was not as successful in respect to the number of eggs taken as was the previous season. In 1914 egg-taking began on August 5, ending October 11, during which period 21,300,000 red-salmon eggs were taken, while in the period from August 9 to November 13, 1915, the total take of red-salmon eggs was 7,500,000. Until three years ago this would have been regarded as a very fair take, but since that time collections have been much larger, with the exception of that of 1915. Of the eggs taken in 1914 the total number of fry planted in the fiscal year ended June 30, 1915, was 20,300,000. This makes a loss of 1,000,000 eggs and fry, or 4.6 per cent. The eggs at this station are taken by the improved method of incision, in which the females are killed by a blow on the head and an incision is made from the pectoral fins to the vent.

A series of small ponds near the hatchery, into which the fry are placed after coming from the hatchery troughs are ideally situated in some respects as they represent very closely natural conditions. These ponds are protected from the depredations of birds and other natural enemies by means of webbing which is spread across them. After the fry have remained in these ponds for some time and have attained considerable growth they are allowed to work down into the lake where they remain for a year before leaving for salt water.

HETTA.

The Hetta hatchery, which is operated by the Northwestern Fisheries Co., is located on Hetta Lake near the southern end of Prince of Wales Island, in southeastern Alaska. This hatchery was rebuilt in 1912 and now has a capacity of about 12,000,000 red-salmon eggs. In the egg-collecting season extending from August 8 to December 18, 1914, 7,438,500 red-salmon eggs were taken. The loss of eggs was 319,000, which was 4.2 per cent. The sworn statement returned by the Northwestern Fisheries Co., shows that 7,142,500 young red salmon were released in the fiscal year ending June 30, 1915. This might indicate a slight discrepancy from the above figures, but it is accounted for by the fact that at the Hetta station it is customary to carry over a few of the previous season's fry into the succeeding fiscal year for which returns of fry released are made. The law provides that such returns shall show the number of fry liberated during the 12 months immediately preceding June 30.

The egg-collecting season of 1915 began August 19, when 216,000 red-salmon eggs were secured. At the conclusion of egg-collecting operations on December 31, 1915, a total take of 8,114,000 red-salmon eggs had been made. Totals of 2,044 females and 1,962 males were handled. All eggs were taken by the modern method of incision.

Some trouble has been experienced at this station on account of the unusual amount of fine sediment which is carried into the troughs from the supply pond a few hundred yards above the hatchery. This has been improved somewhat by a change in the method of drawing water from the supply pond, but further screening will be necessary in order to entirely overcome this difficulty.

KLAWAK.

The Klawak hatchery is located on the lake a few miles above the village of that name on the west coast of Prince of Wales Island in southeastern Alaska. This hatchery was reported last year as being operated jointly by the North Pacific Trading & Packing Co. and the North Alaska Salmon Co. This year, however, it is listed under the name of the North Pacific Trading & Packing Co. The capacity of the hatchery is approximately 10,000,000 red-salmon eggs. In the egg-collecting season, extending from August 6 to October 2, 1914, a total of 3,816,000 were obtained and placed in baskets in the hatchery. During the continuance of operations, which extended to April 15, 1915, the loss of eggs was 163,000, or 4.2 per cent. In the period from December 14, 1914, to April 15, 1915, the number of young red salmon liberated was 3,653,000. It is reported that all of these were in good condition. The hatchery is provided with a small rearing pond, but at times it has not been serviceable because it freezes to the bottom. This difficulty can be overcome by deepening the pond. Operations would be facilitated further by the construction of another pond at least 20 by 30 feet in size. Through the egg-collecting season of 1915, 4,130,000 red-salmon eggs were taken.

When the station was visited in September, 1915, by Inspector Walker, special attention was devoted to the conditions under which fry are liberated and the matter was discussed with the hatchery employees at some length. They were made to realize that hatchery efficiency does not consist merely in liberating a stated number of young fish, but rather that the percentage of those surviving until they are fully able to take care of themselves is the real basis for determining the efficiency of all fish-cultural work. Unusual interest was shown by the hatchery employees in the selection of suitable locations for the planting of the young salmon and the exercise of judgment as to the time of planting, so that the greatest possible number of fish might survive.

In December, 1915, the North Pacific Trading & Packing Co. advised that they had in contemplation the blasting away of a number of rocks which partly obstructed the outlet of the lake. The removal of these rocks would give the adult salmon a better chance to get into the lake, and at the same time the lake could not rise during storms to such a height as to allow the fish to get around the racks at the different streams tributary to the lake where they are taken for spawning purposes. The Bureau expressed its hearty concurrence in the development of any plan along this line that might have a beneficial effect on the supply of salmon or might in any way improve the operation of the hatchery. This work is in line with similar undertakings contemplated by the Bureau elsewhere in Alaska.

GENERAL STATISTICS OF THE FISHERIES IN 1915.

In 1915 the total investment in the Alaska fisheries amounted to $37,316,560, an increase of $277,928 over 1914. Approximately 86 per cent of this investment was in the salmon industry. The number of persons engaged in 1915 was 22,462, or an increase of 1,262 over 1914. The total value of the products in 1915 was $20,999,343, or a decrease of $243,632 from 1914. Although the actual quantity of fishery products produced in 1915 was greater than in the previous year the total value of the 1915 output was less, chiefly by reason of the lower price obtained for several of the grades of salmon packed and further by reason of the decreased pack of the more valuable red salmon. The total value of the products this year is second only to that of 1914, which was the largest in the history of Alaska.

SUMMARY OF INVESTMENTS IN THE FISHERIES OF ALASKA IN 1915.

Industries.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Salmon canning	$11,768,284	$5,774,379	$13,739,662	$31,282,325
Salmon pickling	....	89,925	246,687	336,612
Salmon mild curing	477,259	4,000	6,100	487,359
Herring fishery	211,640	....	....	211,640
Halibut fishery	2,842,800	....	....	2,842,800
Cod fishery	....	570,990	....	570,990
Whale fishery	889,450	....	564,400	1,453,850
Atka mackerel	....	....	3,105	3,105
By-products	127,879	....	....	127,879
Total	16,317,312	6,439,294	14,559,954	37,316,560

SUMMARY OF PERSONS ENGAGED IN THE FISHERIES OF ALASKA IN 1915.

Races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Whites	5,011	2,133	4,145	11,289
Natives	3,525	728	747	5,000
Japanese	807	334	490	1,631
Chinese	953	396	841	2,190
Miscellaneous[a]	467	281	1,604	2,352
Total	10,763	3,872	7,827	22,462

[a] Filipinos, Mexicans, Negroes, Porto Ricans, etc.

SUMMARY OF PRODUCTS OF THE ALASKA FISHERIES IN 1915.

Products.	Quantity.	Value.
Salmon:		
Canned ... cases	4,500,293	$18,653,015
Mild cured ... pounds	2,224,800	191,523
Pickled ... barrels	13,293	148,640
Fresh (including local) ... pounds	2,416,603	192,268
Frozen ... do	720,791	27,276
Dry salt, dried, and smoked backs ... do	45,625	1,423
Halibut:		
Fresh (including local) ... do	10,047,634	554,898
Frozen ... do	5,589,864	244,423
Fletched ... do	80,291	2,690
Cod ... do	14,195,775	390,199
Herring ... do	7,194,610	114,099
Herring oil ... gallons	130,028	26,005
Herring fertilizer ... pounds	1,238,000	15,475
Whale oil ... gallons	876,500	295,000
Sperm oil ... do	101,800	38,000
Whale fertilizer ... pounds	2,990,000	48,750
Trout ... do	41,975	3,420
Black cod ... do	142,550	3,971
Atka mackerel ... barrels	30	300
Crabs ... pounds	14,395	713
Miscellaneous fresh fish, local ... do	100,000	7,000
By-products oil ... gallons	47,976	14,227
By-products fertilizer and meal ... pounds	1,562,000	26,028
Total	....	20,999,343

THE SALMON INDUSTRY.

The outstanding feature of the Alaska salmon industry in 1915 was the enormous increase in the pack of humpbacks in southeast Alaska, where 1,820,191 cases of this species were produced as against the previous record for humpbacks in this section of 1,289,737 cases packed in 1913. There was also a good increase in the pack of pinks both in central and western Alaska. Another feature of this season's operations was the lighter run of red salmon in western Alaska. For the three previous years the catch of reds in the Bristol Bay district was unusually good, the approximate catch in 1912 being 19,900,000, in 1913 it was 21,500,000, and in 1914 it was 20,900,000, but in 1915 it declined to about 16,800,000. This, however, is larger than the catch of red salmon in those waters in 1910, when the take numbered only 11,600,000. It is worthy of mention that there is an increasing use of purse seines in the Bristol Bay region. In 1915 more than a million red salmon were taken by this form of apparatus whereas three years ago the catch was confined exclusively to traps and gill nets, chiefly the latter. It is regarded as quite likely that within a few years the Bristol Bay district will be the scene of an extensive purse-seine fishery. Although western and southeast Alaska showed a decrease in the pack of reds in 1915, central Alaska yielded a gratifying increase in this valuable species.

The pack of chums in Alaska was lighter this year than in 1914, but it was apparently due more to the fact that some of the canneries filled all available cans during the extraordinarily heavy run of pinks rather than to any pronounced shortage of chums. A number of plants thus ceased packing without waiting to take advantage of the later run of chums in southeast Alaska. This rather early closing showed its effect also in a somewhat smaller pack of cohos than was put up in 1914. The pack of kings in all three districts of Alaska was better than in the previous year. This is explained in part by the fact that the lessened demand for mild-cured salmon on account of the European war resulted in the canning of larger numbers of king salmon which otherwise would probably have been mild cured. The production of pickled salmon was only about half that of 1914, the reason being due chiefly to the lessened run of reds in western Alaska. The fresh and frozen salmon industries, which are prosecuted in southeast Alaska, showed good increases in 1915.

SALMON CANNING.

CHANGES IN CANNERIES.

The plant of the Canoe Pass Packing Co., at Canoe Pass, in southeast Alaska, was dismantled and the machinery moved to a new location at Cordova. The plant at Canoe Pass was built and operated in

1912, but has not been used since. The small cannery of the Revilla Fish Products Co., at Ketchikan has not been operated since 1912, and unless work is resumed it will no longer be listed. The Hoonah Packing Co. acquired the cannery of the Admiralty Trading Co., operated at Gambier Bay in 1912 and 1913, but closed in 1914 and 1915. The canneries operated in 1914 by Gorman & Co. at Shakan and Kasaan were operated in 1915 by the Anacortes Fisheries Co. The plant formerly operated by the Pacific Coast & Norway Packing Co. at Petersburg was taken over by the Petersburg Packing Co. The Straits Packing Co. acquired the cannery last operated in 1913 by the Skowl Arm Packing Co., at Skowl Arm. It is reported that this new company was formed chiefly by those formerly interested in the cannery of the Kuiu Island Packing Co., which plant was destroyed by fire in the fall of 1914. The cannery at Hawk Inlet, operated for several years by the Hawk Fish Co., was operated in 1915 under the firm name of P. E. Harris & Co. Another change in firm name this year is that of the Karheen Packing Co., which was formerly known as the Irving Packing Co. The North Alaska Salmon Co. closed its Hallerville cannery and operated for the first time its new plant on the eastern side of Kvichak Bay above Pedersens Point. Libby, McNeill & Libby acquired from Gorman & Co. the cannery at Dry Bay formerly operated by the St. Elias Packing Co. It is probable that it will be used in conjunction with the cannery of the Yakutat & Southern Railway Co., which is also owned by Libby, McNeill & Libby.

NEW CANNERIES.

Six new canneries were operated in Alaska in 1915 by the following companies: Doyhof Fish Products Co., at Scow Bay, near Petersburg, in southeast Alaska; Canoe Pass Packing Co., at Cordova; Copper River Packing Co., at Abercrombie, near Mile 55 on the Copper River; the Deep Sea Salmon Co., at Goose Bay, on Knik Arm, in central Alaska; the Nelson Lagoon Packing Co., at Nelson Lagoon; and the North Alaska Salmon Co., on the eastern side of the Kvichak River above Pedersens Point, in western Alaska.

The foregoing, together with the cannery of the newly organized Straits Packing Co., not operated in 1914, makes an apparent gain of seven canneries for 1915, but deduction must be made from the 1914 total of the two canneries destroyed by fire, namely, those of the Kuiu Island Packing Co. at Beauclaire and of the Alaska Fishermen's Packing Co. on Kvichak Bay; also there must be deducted the cannery of the North Alaska Salmon Co. at Hallerville, not operated in 1915, thus making a net increase of four canneries in operation in 1915 over 1914.

Of the preparatory arrangements for the operation of additional canneries in 1916, there may be mentioned the following: The Alaska Salmon Co. erected buildings at Graveyard Point, Koggiung, which possibly may be used for a cannery in 1916. The plant was operated as a saltery in 1915. The Bristol Bay Packing Co. erected new buildings for a large cannery in close proximity to their present plant on Kvichak Bay. The Naknek Packing Co. erected buildings for a new plant about 2 miles above their present plant on Naknek River and planned to operate it in 1916. The Red Salmon Canning Co. also erected buildings on the Naknek River to be used as a cannery in 1916.

CANNERIES OPERATED IN 1915.

During the year 1915 there were 45 canneries in operation in southeast Alaska, 17 in central Alaska, and 23 in western Alaska, a total of 85 canneries for the Territory.

COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED AND NUMBER OF TRAPS OWNED BY EACH.

Names.	Canneries.	Location.	Traps.
Southeast Alaska:			
Alaska Fish Co	1	Waterfall	1
Alaska Pacific Fisheries	3	Chilkoot	[a] 7
		Chomly	[b] 7
		Yes Bay	[c] 7
Alaska Packers Association	2	Loring	[b] 7
		Wrangell	[d] 5
Alaska Sanitary Packing Co	1	Wrangell	
Anacortes Fisheries Co	2	Kasaan	4
		Shakan	2
Astoria & Puget Sound Canning Co	1	Excursion Inlet	5
Barnes, F. C., Co	1	Lake Bay	[e] 5
Deep Sea Salmon Co	1	Ford Arm	[d] 5
Doyhof Fish Products Co	1	Scow Bay	
Fidalgo Island Packing Co	1	Ketchikan	5
George Inlet Packing Co	1	George Inlet	1
Harris, P. E., & Co	1	Hawk Inlet	7
Hidden Inlet Canning Co	1	Hidden Inlet	
Hoonah Packing Co	1	Hoonah	12
Hume, G. W., Co	1	Nakat Harbor	
Karheen Packing Co	1	Karheen	2
Lindenberger Packing Co	2	Craig	1
		Roe Point	[f] 6
Myers, Geo. T., & Co	1	Chatham	6
North Pacific Trading & Packing Co	1	Klawak	
Northwestern Fisheries Co	4	Dundas Bay	5
		Hunter Bay	
		Quadra	1
		Santa Ana	[e] 1
Pacific American Fisheries	1	Excursion Inlet	18
Petersburg Packing Co	1	Petersburg	3
Pillar Bay Packing Co	1	Pillar Bay	2
Point Warde Packing Co	1	Point Warde	[e] 4
Pure Food Fish Co	1	Ketchikan	1
Sanborn-Cram Co	1	Burnett Inlet	[c] 5
Sanborn-Cutting Co	1	Kake	[c] 3
Starr-Collinson Packing Co	1	Moira Sound	[c] 3
Straits Packing Co	1	Skowl Arm	
Sunny Point Packing Co	1	Sunny Point	1
Swift-Arthur-Crosby Co	1	Heceta Island	
Taku Canning & Cold Storage Co	1	Taku Harbor	[f] 10
Tee Harbor Packing Co	1	Tee Harbor	6
Thlinket Packing Co	1	Funter Bay	17
Ward Cove Packing Co	1	Ward Cove	
Wiese Packing Co	1	Rose Inlet	2
Yakutat & Southern Railway Co	1	Yakutat	

[a] 3 floating.
[b] 5 floating.
[c] All floating.
[d] 4 floating.
[e] 1 floating.
[f] 2 floating.

COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED AND NUMBER OF TRAPS OWNED BY EACH—Continued.

Names.	Canneries.	Location.	Traps.
Central Alaska:			
Alaska Packers Association	4	Alitak	2
		Chignik	3
		Larsen Bay	
		Kasilof	14
Canoe Pass Packing Co	1	Cordova	
Columbia River Packers' Association	1	Chignik	3
Copper River Packing Co	1	Abercrombie	
Deep Sea Salmon Co	1	Knik Arm	2
Fidalgo Island Packing Co	1	Port Graham	5
Kadiak Fisheries Co	1	Kodiak	
Libby, McNeill & Libby	1	Kenai	15
Northwestern Fisheries Co	4	Chignik	3
		Kenai	12
		Orca	
		Uyak	
Pacific American Fisheries	1	King Cove	8
Seldovia Salmon Co	1	Seldovia	7
Western Alaska:			
Alaska Fishermen's Packing Co	1	Nushagak	
Alaska Packers Association	8	Kvichak River (2)	
		Naknek River (3)	
		Nushagak Bay (2)	5
		Ugaguk River	
Alaska-Portland Packers' Association	1	Nushagak Bay	3
Alaska Salmon Co	1	Wood River	
Bristol Bay Packing Co	1	Kvichak Bay	
Columbia River Packers' Association	1	Nushagak Bay	
Midnight Sun Packing Co	1	Kotzebue Sound	1
Naknek Packing Co	1	Naknek River	
Nelson Lagoon Packing Co	1	Nelson Lagoon	4
North Alaska Salmon Co	4	Kvichak River (2)	
		Nushagak Bay	
		Ugaguk River	
Northwestern Fisheries Co	1	Nushagak	
Pacific American Fisheries	1	Port Moller	2
Red Salmon Canning Co	1	Ugashik River	

CANNERIES NOT OPERATED IN 1915.

Three canneries in southeast Alaska were not operated in 1915, as follows:

	Location of plant.
Hoonah Packing Co	Gambier Bay.
Metlakatla Industrial Co	Metlakatla.
St. Elias Packing Co	Dry Bay.

SALMON CATCH AND FORMS OF GEAR.

There were in operation in southeast Alaska in the salmon canning industry 137 driven and 48 floating traps, or a total of 185 traps; while in central Alaska there were 84 driven traps and in western Alaska 15 driven traps; this makes a total of 236 driven and 48 floating traps, or a grand total of 284 traps operated in the commercial fishery of Alaska in 1915. In 1914 the total number of traps in operation was 252, of which 211 were driven and 41 floating; thus 1915 shows a gain of 25 driven and 7 floating traps, or a total increase of 32 traps over 1914. By geographical sections the gains in 1915 were 7 floating traps in southeast Alaska, 24 driven traps in central Alaska, and 2 driven traps in western Alaska, while there was a decrease of 1 driven trap in southeast Alaska.

In 1915 the total number of purse and haul seines operated in the salmon industry of Alaska was 361 as against 336 the previous year. This gain of 25 seines for 1915 occurred almost wholly in southeast Alaska.

Of the total catch of salmon in Alaska in 1915, the proportion taken in traps was 42 per cent, by seines 29 per cent, by gill nets 27 per cent, and less than 1 per cent by lines and dip nets. By way of comparison it may be noted that in the previous year the trap catch was 31 per cent, the seine catch was 27 per cent, the gill-net catch was 41 per cent, and the proportion by lines and dip nets practically the same as in 1915. The most notable feature of this is a decrease in 1915 of 14 per cent in the proportionate gill-net catch, which must be accounted for by reason of the lessened run of salmon in western Alaska where the catch is chiefly by gill nets. This proportionate decrease was offset by a proportionate increase of over 11 per cent caught by traps and more than 2 per cent in seines. The following table shows the proportionate catches by districts by the three principal forms of apparatus:

PERCENTAGE OF SALMON CAUGHT IN EACH DISTRICT BY PRINCIPAL FORMS OF GEAR.

Apparatus.	Southeast Alaska.		Central Alaska.		Western Alaska.	
	1914	1915	1914	1915	1914	1915
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Seines	47	39	36	32	4	6
Traps	48	57	56	52	4	7
Gill nets	8	3	8	15	92	86

The total catch of salmon of all species in the commercial fishery of Alaska in 1915 numbered 63,537,244 as against 54,651,915 in 1914, a gain of 8,885,329. In southeast Alaska there was an increase of about 15,000,000 salmon, but this was offset by decreases of more than 1,000,000 in central and about 5,000,000 in western Alaska as compared with 1914. In 1915 there were gains of approximately 14,200,000 humpback, 110,000 king, and 13,000 coho salmon, while the number of reds decreased 3,950,000 and chums fell off 1,450,000.

SALMON TAKEN IN 1915, BY SPECIES AND APPARATUS, FOR EACH GEOGRAPHIC SECTION OF ALASKA.

Apparatus and species.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Seines:	*Number.*	*Number.*	*Number.*	*Number.*
Coho, or silver	234,038	58,249	....	292,287
Chum, or keta	2,159,904	191,777	186	2,351,867
Humpback, or pink	11,542,551	719,943	....	12,262,494
King, or spring	11,436	939	5,343	17,718
Red, or sockeye	930,434	1,551,093	1,225,832	3,707,359
Total	14,878,363	2,522,001	1,231,361	18,631,725

SALMON TAKEN IN 1915, BY SPECIES AND APPARATUS, FOR EACH GEOGRAPHIC SECTION OF ALASKA—Continued.

Apparatus and species.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Gill nets:	*Number.*	*Number.*	*Number.*	*Number.*
Coho, or silver	214,310	71,719	99,225	385,254
Chum, or keta	48,618	102	539,591	588,311
Humpback, or pink	97,800	1,134	37,000	135,934
King, or spring	77,631	37,827	140,974	256,432
Red, or sockeye	483,682	1,077,706	14,561,820	16,123,207
Total	922,041	1,188,487	15,378,610	17,489,138
Traps:				
Coho, or silver	392,632	159,362	24,050	576,044
Chum, or keta	1,416,989	256,451	205,890	1,879,330
Humpback, or pink	18,308,532	189,434	....	18,497,966
King, or spring	22,903	57,027	27,960	107,890
Red, or sockeye	1,419,807	3,443,112	994,016	5,856,935
Total	21,560,863	4,105,386	1,251,916	26,918,165
Lines:				
Coho, or silver	77,999	....	....	77,999
King, or spring	226,853	....	....	226,853
Total	304,852	....	....	304,852
Dip nets:				
King, or spring	....	2,054	....	2,054
Red, or sockeye	....	191,310	....	191,310
Total	....	193,364	....	193,364
Total:				
Coho, or silver	918,979	289,330	123,275	1,331,584
Chum, or keta	3,625,511	448,330	745,667	4,819,508
Humpback, or pink	29,948,883	910,511	37,000	30,896,394
King, or spring	338,823	97,847	174,277	610,947
Red, or sockeye	2,833,923	6,263,220	16,781,668	25,878,811
Grand total	37,666,119	8,009,238	17,861,887	63,537,244

STATISTICS.

The number of canneries in operation in Alaska in 1915 was 85, as compared with 81 in 1914. The total investment increased from $30,830,435 in 1914 to $31,282, 325 in 1915. This increase was chiefly in central and western Alaska.

The number of persons employed in canning operations in 1914 was 16,307 and in 1915 the number was 17,741, an increase of 1,434 persons. Gains were shown in all three districts. The most notable feature was the increase of 598 Indians over 1914. The total number of Indians employed in 1915 in the salmon canning industry was 4,325. There were smaller gains in 1915 in the number of whites, Chinese, and Japanese engaged in this industry.

In 1914 the pack of canned salmon was 4,056,653 cases, valued at $18,920,589, while in 1915 it was 4,500,293, valued at $18,653,015, an increase of 443,640 cases, but a decrease of $267,574 in value. This seeming anomaly is accounted for by reason of the much larger pack of lower-priced fish in 1915. By sections the case-pack comparison is as follows: Southeast Alaska advanced from 1,776,075 to 2,549,212 cases, an increase of 773,137 cases; central Alaska declined from

658,791 to 632,848 cases, a decrease of 25,943 cases; while in western Alaska there was a decline from 1,621,787 to 1,318,233 cases, a decrease of 303,554 cases from the 1914 pack in that region. Comparisons by species show the following: The pack of cohos declined from 157,063 to 124,268 cases, a decrease of 32,795 cases; chums declined from 663,859 to 479,946 cases, a decrease of 183,913 cases; and reds declined from 2,201,643 to 1,932,312 cases, a decrease of 269,331 cases in 1915. Humpbacks went up from 986,049 to 1,875,516 cases, an advance of 889,467 cases; and kings increased from 48,039 to 88,251, a gain of 40,212 cases in 1915. The net increase for all species in 1915 was 443,640 cases.

The pack of salmon in 1915 is the largest in the history of Alaska, exceeding the previous record of 1914 by 443,640 cases, but as above mentioned the 1915 pack was $267,574 less in value because of the smaller production of the higher priced red salmon and the greatly increased pack of the less valuable humpbacks.

INVESTMENT IN SALMON-CANNING INDUSTRY IN 1915.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Canneries operated	45	$3,699,069	17	$1,612,984	23	$3,158,048	85	$8,470,101
Working capital		4,221,500		1,953,046		5,981,997		12,156,543
Wages paid		2,095,221		927,368		2,321,412		5,354,001
Vessels:								
Power vessels over 5 tons	122	651,210	38	410,711	52	688,604	212	1,750,525
Net tonnage	2,456		1,315		4,110		7,881	
Launches under 5 tons	41	42,636	25	31,396	28	85,553	94	159,585
Sailing	7	174,700	11	401,272	36	816,035	54	1,392,007
Net tonnage	9,081		19,242		49,164		77,487	
Boats, sail and row	772	53,832	478	44,646	1,077	250,010	2,327	348,488
Lighters, scows, house boats	271	127,270	171	103,713	158	168,348	600	399,331
Pile drivers	38	113,126	31	84,298	20	41,300	89	238,724
Apparatus:								
Haul seines	18	2,118	37	12,665	7	16,926	62	31,709
Fathoms	1,413		8,181		1,750		11,344	
Purse seines	270	100,333	11	5,560			281	105,893
Fathoms	54,948		3,666				58,614	
Gill nets	123	13,406	444	16,585	1,825	179,868	2,392	209,859
Fathoms	16,750		19,111		252,875		288,736	
Traps, driven	137	377,318	84	170,255	15	22,261	236	569,834
Traps, floating	48	96,545					48	96,545
Total		11,768,284		5,774,379		13,739,662		31,282,325

PERSONS ENGAGED IN THE SALMON-CANNING INDUSTRY IN 1915.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites	777	798	2,388	3,963
Indians	1,310	292	166	1,768
Chinese	....	....	....	....
Japanese	1	....	....	1
Miscellaneous [a]	15	....	....	15
Total	2,103	1,090	2,554	5,747
Shoresmen:				
Whites	1,063	465	1,257	2,785
Indians	1,657	356	529	2,542
Chinese	953	396	841	2,190
Japanese	765	332	456	1,553
Miscellaneous [a]	452	281	1,604	2,337
Total	4,890	1,830	4,687	11,407
Transporters:				
Whites	271	108	192	571
Indians	6	9	....	15
Chinese	....	....	....	....
Japanese	....	1	....	1
Miscellaneous [a]	....	....	....	....
Total	277	118	192	587
Grand total:				
Whites	2,111	1,371	3,837	7,319
Indians	2,973	657	695	4,325
Chinese	953	396	841	2,190
Japanese	766	333	456	1,555
Miscellaneous [a]	467	281	1,604	2,352
Total	7,270	3,038	7,433	17,741

[a] Filipinos, Mexicans, Negroes, Porto Ricans, etc.

OUTPUT OF CANNED SALMON IN 1915.[a]

Product.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Cases.	*Value.*	*Cases.*	*Value.*	*Cases.*	*Value.*	*Cases.*	*Value.*
Coho, or silver:								
½-pound flat	2,050	$11,639	....	....	....	....	2,050	$11,639
1-pound flat	613	3,188	1,725	$7,795	....	....	2,338	10,983
1-pound tall	87,636	371,539	21,839	96,252	10,405	$45,711	119,880	513,502
Total	90,299	386,366	23,564	104,047	10,405	45,711	124,268	536,124
Chum, or keta:								
1-pound flat	229	733	88	264	....	....	317	997
1-pound tall	373,100	966,581	39,318	102,086	67,211	173,657	479,629	1,242,324
Total	373,329	967,314	39,406	102,350	67,211	173,657	479,946	1,243,321
Humpback, or pink:								
½-pound flat	4,325	19,451	....	....	....	....	4,325	19,451
1-pound flat	3,508	11,927	....	....	....	....	3,508	11,927
1-pound tall	1,812,358	5,043,238	46,479	119,649	8,846	22,938	1,867,683	5,185,825
Total	1,820,191	5,074,616	46,479	119,649	8,846	22,938	1,875,516	5,217,203
King, or spring:								
½-pound flat	100	600	....	....	2,304	12,902	2,404	13,502
1-pound flat	40	208	986	4,902	2,729	16,854	3,755	21,964
1-pound tall	27,303	123,217	22,179	97,177	32,610	152,406	82,092	372,800
Total	27,443	124,025	23,165	102,079	37,643	182,162	88,251	408,266
Red, or sockeye:								
½-pound flat	25,302	222,457	11,183	96,849	15,548	122,976	52,033	442,282
1-pound flat	38,054	248,017	35,946	247,560	38,847	265,012	112,847	760,589
1-pound tall	174,594	971,042	453,105	2,614,800	1,137,440	6,452,950	1,765,139	10,038,792
1½-pound nominals	....	....	....	....	2,293	6,438	2,293	6,438
Total	237,950	1,441,516	500,234	2,959,209	1,194,128	6,847,376	1,932,312	11,248,101
Grand total	2,549,212	7,993,837	632,848	3,387,334	1,318,233	7,271,844	4,500,293	18,653,015

[a] Cases containing ½-pound cans have been reduced one-half in number and those containing 1½-pound cans have been increased one-half in number. Thus, for the purpose of affording fair comparison, all are put upon the basis of forty-eight 1-pound cans per case.

OUTPUT OF CANNED SALMON, 1909 TO 1915.[a]

Products.	1909	1910	1911	1912	1913	1914	1915	Total.
Coho, or silver:	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
½-pound flat	....	163	1,574	2,719	3,587	4,579	2,050	14,672
1-pound flat	1,206	2,249	1,075	17	266	285	2,338	7,436
1-pound tall	55,350	111,614	131,259	163,462	71,926	152,199	119,880	805,690
Total	56,556	114,026	133,908	166,198	75,779	157,063	124,268	827,798
Chum, or keta:								
½-pound flat	....	....	....	2,795	985	373	....	4,153
1-pound flat	....	....	7,245	....	2,619	5,568	317	15,749
1-pound tall	120,712	254,218	316,550	661,838	287,314	657,918	479,629	2,778,179
Total	120,712	254,218	323,795	664,633	290,918	663,859	479,946	2,798,081
Humpback, or pink:								
½-pound flat	....	3,188	4,836	13,712	20,822	2,103	4,325	48,986
1-pound flat	....	7,900	9,437	....	3,258	9,286	3,508	33,389
1-pound tall	464,873	543,233	991,005	1,266,426	1,348,801	974,660	1,867,683	7,456,681
Total	464,873	554,321	1,005,278	1,280,138	1,372,881	986,049	1,875,516	7,539,056
King, or spring:								
½-pound flat	....	54	67	5,151	1,585	3,143	2,404	12,404
1-pound flat	....	....	....	....	....	4,804	3,755	8,559
1-pound tall	48,034	40,167	45,451	38,166	32,785	40,092	82,092	326,787
Total	48,034	40,221	45,518	43,317	34,370	48,039	88,251	347,750
Red, or sockeye:								
½-pound flat	8,193	22,320	13,601	28,024	29,041	53,825	52,033	207,037
1-pound flat	85,193	39,941	4,967	16,242	11,735	64,671	112,847	335,596
1-pound tall	1,611,916	1,388,006	1,296,750	1,856,089	1,924,461	2,083,147	1,765,139	11,925,508
1½-pound nominals	....	....	....	....	....	....	2,293	2,293
Total	1,705,302	1,450,267	1,315,318	1,900,355	1,965,237	2,201,643	1,932,312	12,470,434
Grand total	2,395,477	2,413,053	2,823,817	4,054,641	3,739,185	4,056,653	4,500,293	23,983,119

[a] The number of cases shown has been put upon the common basis of forty-eight 1-pound cans to the case.

AVERAGE ANNUAL PRICE PER CASE OF FORTY-EIGHT 1-POUND CANS OF SALMON, 1905 TO 1915.

Products.	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915
Coho, or silver	$3.20	$3.63	$3.91	$3.98	$4.07	$4.80	$5.67	$4.44	$3.45	$4.30	$4.31
Chum, or keta	2.69	2.87	2.97	2.53	2.28	3.04	3.72	2.37	2.21	3.37	2.59
Humpback, or pink	2.95	3.00	3.16	2.69	2.40	3.15	3.94	2.55	2.58	3.50	2.78
King, or spring	3.28	3.78	4.18	4.20	4.32	5.34	6.48	5.37	4.04	5.01	4.63
Red, or sockeye	3.38	3.77	4.59	4.52	4.53	5.30	6.33	5.45	4.54	5.58	5.82

DISASTERS AND LOSSES IN THE SALMON INDUSTRY.

The most serious loss in the salmon industry in the year 1915 was the destruction by fire on June 10 of the cannery of the Alaska Fishermen's Packing Co., on the Kvichak River. The cause of the fire was unknown. It occurred just after the work of making cans for the season had been completed. After the fire part of the cannery crew was returned to Seattle, while a number of the fishermen were retained to carry on salting operations and to fish for the Nushagak cannery of the same company. The steamer *North Star* made a number of trips to Nushagak with fish caught in the Kvichak region. Early in July the freight steamer *Bertha* was dispatched from Seattle with a cargo of lumber and other materials to rebuild the cannery. On July 18 the vessel went ashore on Harvester Island, at Uyak Bay. The following day she took fire and became a total loss. A small part of the cargo was salvaged.

The ship *Sintram* (1,495 tons), of the Naknek Packing Co., while northbound in the spring, went ashore May 2 off Ugaguk and became a total loss. The book value of the vessel was approximately $8,000, but under existing conditions several times that amount would be required to replace her. Most of the cargo was saved, so that the cannery was able to conduct operations through the season.

In addition to the foregoing there were various smaller losses. In this connection mention is made of the destruction of the bunkhouse of the Anacortes Fisheries Co., at Shakan, the property loss being $1,000, and in addition two of the Chinese employees lost their lives. The Tee Harbor Packing Co. reported the loss of a trap valued at $2,500. The Doyhof Fish Products Co. reported the loss by drowning of one shoresman and one fisherman. The Canoe Pass Packing Co. lost 208 cases of salmon. In western Alaska seven fishermen and two transporters were drowned, and gear to the value of $5,600 was reported as lost. In addition there were minor losses of fishing gear, small boats, and miscellaneous items of equipment in various parts of Alaska.

MILD CURING OF SALMON.

The continuance of the war in Europe resulted in a further marked decline in the industry of mild curing salmon in 1915. Heretofore, it has been chiefly to the markets in Germany that the mild-cured product has been shipped, hence the discontinuance of possibilities of trade with that country has made itself felt to a marked degree in the mild-cure industry. This state of affairs has made it necessary for the American markets to absorb this product. Fortunately, there is a growing demand for mild-cured salmon in this country, although the high price which it commands has had a tendency toward conservativeness in the development of this line of trade. Mild-cured salmon form a particularly attractive food article, especially when prepared in a lightly smoked condition.

The lessened activity in the mild-cure industry in Alaska in 1915 resulted in the preparation of a product excellent in quality. In some seasons past many of the smaller king salmon have been mild-cured, but this year the product was made up almost wholly of select, large-sized fish. The smaller salmon were as a rule disposed of to canneries, which is evidenced by the increased production of canned king salmon this year. There was also an increase in the number of frozen salmon, some of which undoubtedly would have been marketed as a mild-cured product if conditions had warranted.

One of the important trolling grounds for king salmon in the mild-cure fishery is about Forrester Island, which is a Federal bird reserve under the administration of the Department of Agriculture. As in the previous year, operations on that island were under the immediate direction of Game Warden Willett of that department, who was stationed there to see that the birds resorting to the island were not disturbed. The first fishermen arrived at the island on May 8, and by May 25 the maximum number was present. Operations continued until along in August, when the camp on the island was practically deserted. A number of fishermen left about the first of July to work in the canneries. A total of 180 permits were issued this year as compared with 457 in 1914. This gives an idea of the decline which the mild-cure industry felt in 1915. Of the 180 permits granted this year, 111 were issued to natives. Quite a number of the remaining permits were issued to foreigners who had taken out their first papers declaring their intentions of citizenship. Fishing was very good, some of the hand-boat trollers receiving as much as $200 to $500 for approximately three months' work. Some of the power boats cleared as high as $1,000. Early in the season the price paid by buyers was 50 cents for red-meated king salmon, 20 cents for white-meated kings, and 5 cents each for coho salmon. Some of the fishermen were dissatisfied with these prices and sent part of their catch to Prince Rupert. As the season advanced competition between the buyers became keen, and they met the Prince Rupert prices, paying 60 cents for red-meated salmon and 10 cents for cohos.

The principal mild-cure operators in southeast Alaska were Engelbr. Wiese (Inc.), with four plants, one each at Waterfall, Port Conclusion, Hoonah, and Cape Fanshaw; Columbia & Northern Fishing & Packing Co., at Wrangell; Diamond T Packing Co., at Dall Island; and Vendsyssel Packing Co., at Tyee. Some of the other more important concerns which engaged in this business were Swift-Arthur-Crosby Co., at Heceta Island; Taku Canning & Cold Storage Co., at Taku; Lindenberger Packing Co., at Craig; and the Petersburg Packing Co., at Petersburg. In central Alaska but little was done in mild-curing salmon, a small quantity only being put up on Cook Inlet. In western Alaska a few tierces of mild-cured salmon were put up on the Kuskokwim River.

The investment in mild-cure work this year was $487,359, as compared with $777,564 in 1914. The number of fixed plants decreased from 17 in 1914 to 15 in 1915, this decline being in southeast Alaska. There was also a proportionate decrease in the number of persons engaged from 2,161 in 1914 to 1,725 in 1915. The total product declined from 4,091 tierces[a] in 1914, valued at $300,052, to 2,781 tierces in 1915, valued at $191,523, a decrease of 1,310 tierces and $108,529 in value.

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[a] Each tierce contains 800 pounds of salmon.

INVESTMENT IN THE SALMON MILD-CURING INDUSTRY IN 1915.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Fixed plants	13	$58,394	1	$1,500	1	$2,000	15	$61,894
Operating capital		119,700		2,000		3,000		124,700
Vessels:								
Power vessels over 5 tons	11	37,385					11	37,385
Net tonnage	169						169	
Launches under 5 tons	370	205,000			1	500	371	205,500
Boats, sail and row	906	35,580			4	200	910	35,780
Gear:								
Purse seines	1	300					1	300
Fathoms	125						125	
Gill nets	160	11,750	2	500	20	400	182	12,650
Fathoms	15,500		500		600		16,600	
Troll lines	4,420	9,150					4,420	9,150
Total		477,259		4,000		6,100		487,359

PERSONS ENGAGED IN THE SALMON MILD-CURING INDUSTRY IN 1915.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites	1,101		2	1,103
Indians	500			500
Shoresmen:				
Whites	73	5	2	80
Indians	6	7	10	23
Transporters: Whites	19			19
Total	1,699	12	14	1,725

PRODUCTS OF THE SALMON MILD-CURING INDUSTRY IN 1915.

Species.	Tierces.	Pounds.	Value.
Southeast Alaska:			
King salmon	2,625	2,100,000	$182,280
Coho salmon	68	54,400	4,393
Total	2,693	2,154,400	186,673
Central Alaska: King salmon	18	14,400	1,350
Western Alaska: King salmon	70	56,000	3,500
Total	88	70,400	4,850
Grand total	2,781	2,224,800	191,523

SALMON PICKLING.

The pickling of salmon in Alaska in 1915 was on a much smaller scale than it has been for years. This is explained chiefly by virtue of the lighter run of reds in the Bristol Bay district where most of the pickling of Alaska salmon is done. In southeast Alaska a few years ago there were a number of salteries in operation, but in 1915 the business of pickling salmon had become reduced to limited proportions, the small production being incidental to other lines of enterprise. It may be noted that there were more cohos pickled in southeast Alaska than in the previous year, as the early closing of part of the canneries resulted in some of the catches of fall cohos being prepared for market in this way. In the last months of the year, after it was apparent that the product of pickled salmon was much below normal, the price ascended to unusually high levels. The price of pickled salmon bellies was also strong, but the production was small, as will be noted from the table of pickled salmon shown on page 43.

A new concern of importance in the Bristol Bay district this year was the Golden Gate Salmon Co. which conducted its pickling operations on the schooner *Hugh Hogan* (355 tons), the vessel being located during the fishing season about 15 miles up the Kvichak River. Among other operators of importance engaged in pickling operations on waters tributary to Bristol Bay were the Alaska Fishermen's Packing Co., Alaska Salmon Co., Olson Bros., and Peter M. Nelson, who had two salteries.

In 1915 there were 17 salteries in operation as compared with 15 in 1914, and the investment increased from $286,356 to $336,612. The number of persons engaged increased from 248 in 1914 to 329 in 1915. The output, however, shows a reduction, for this year it was but 13,293 barrels, valued at $148,640, as against 26,362 barrels, valued at $252,662, in 1914. Approximately 83 per cent of this year's production of pickled salmon in Alaska came from the Bering Sea region, as compared with 89 per cent from that part of Alaska last year.

INVESTMENT IN THE SALMON-PICKLING INDUSTRY IN 1915.

Items.	Central Alaska.		Western Alaska.		Total.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Salteries	8	$26,390	9	$63,517	17	$89,907
Operating capital		37,600		83,340		120,940
Vessels:						
Power vessels over 5 tons	2	9,950	2	20,000	4	29,950
Net tonnage	50		115		165	
Launches under 5 tons	15	8,600	4	6,450	19	15,050
Sailing	1	500	5	48,000	6	48,500
Net tonnage	9		2,220		2,229	
Boats, sail and row	40	2,068	67	12,070	107	14,138
Lighters and scows	1	100	7	5,500	8	5,600
Gear:						
Haul seines	17	2,545	1	100	18	2,645
Fathoms	1,787		75		1,862	
Gill nets	45	2,172	129	7,710	174	9,882
Fathoms	1,813		13,010		14,823	
Total		89,925		246,687		336,612

PERSONS ENGAGED IN THE SALMON-PICKLING INDUSTRY IN 1915.

Occupations and races.	Central Alaska.	Western Alaska.	Total.
Fishermen:			
Whites	22	115	137
Natives	37	6	43
Japanese	1		1
Total	60	121	181
Shoresmen:			
Whites	2	109	111
Natives	3	1	4
Total	5	110	115
Transporters:			
Whites	5	23	28
Natives	5		5
Total	10	23	33
Grand total	75	254	329

BARRELS[a] OF SALMON PICKLED IN 1915, BY SPECIES.

Product.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Coho, or silver	440	$4,901	275	$3,391			715	$8,292
Coho bellies			25	400			25	400
Chum, or keta	8	96			583	$12,374	591	12,470
Humpback, or pink	79	535	160	1,419			239	1,954
Humpback bellies			91	1,273			91	1,273
King, or spring	138	1,552	22	436	694	8,161	854	10,139
King bellies	4	72	1	20			5	92
Red, or sockeye			870	9,417	9,800	102,563	10,670	111,980
Red bellies			103	2,040			103	2,040
Total	669	7,156	1,547	18,396	11,077	123,088	13,293	148,640

[a] Barrels holding 200 pounds of fish.

SALMON FREEZING.

In 1915 there was a considerable increase in the freezing of salmon over the previous year. This line of business is incidental to the freezing of halibut. The companies engaged were the New England Fish Co., the Ketchikan Cold Storage Co., and the San Juan Fishing & Packing Co., at Ketchikan; the Booth Fisheries Co., at Sitka; the Taku Canning & Cold Storage Co., at Taku Inlet; and the Glacier Fish Co. operating the floating cold-storage plant on the barge *Glory of the Seas.*

During 1915 the total quantity of salmon frozen in Alaska was 720,791 pounds, valued at $27,276. This is a big increase over 1914, when the product was 228,528 pounds, valued at $8,551.

SALMON FROZEN IN ALASKA IN 1915.

Species.	Pounds.	Value.
Coho salmon	402,830	$16,873
Chum salmon	281,015	8,491
King salmon	36,946	1,912
Total	720,791	27,276

FRESH-SALMON TRADE.

An extensive industry has been built up in southeast Alaska in the shipment of fresh salmon to Puget Sound. The chief centers are Ketchikan, Wrangell, Petersburg, and Juneau, and the industry is at its best in the spring. The fish are boxed in crushed ice and are handled by the regular steamship lines. The business was prosecuted with unusual vigor in 1915 when, according to figures obtained through the customs records, 2,216,603 pounds of salmon valued at $172,268 were shipped in a fresh condition from Alaska. This represents a pronounced gain over 1914 when 1,759,733 pounds, valued at $60,375, were shipped.

Present facilities do not admit of obtaining full detailed figures in respect to the amount of salmon sold in Alaska for local consumption, but a careful estimate made upon the basis of inquiries at Juneau and other cities leads to the belief that the local markets supplied approximately 600,000 pounds of fresh fish, valued at $48,000. It is estimated that about one-half was halibut, one-third salmon, and the balance miscellaneous fishes such as black cod, herring, bass, and other species.

DRY SALTING, DRYING, AND SMOKING OF SALMON.

The dry salting of salmon in Alaska has been almost wholly discontinued, as their preparation in other ways is much more profitable. The only report of dry-salt salmon in Alaska in 1915 was that of Johnson & Howitzer, of Cold Bay, indicating the preparation of 12,000 pounds of red-salmon backs, valued at $250. The bellies of these fish are included in the figures herein given for pickled bellies. In addition, James J. Bettles, of Eshamy, dried 10,125 pounds of red-salmon backs, valued at $303, resulting from pickling operations. At Seldovia I. D. Nordyke dried approximately 1,500 pounds of chum backs and 300 pounds of pink-salmon backs, the total value of which was $105. In conjunction with their saltery operated in the Prince William Sound region, Lee & McKnight pickled 5,000 pounds of coho backs, valued at $150, and 11,000 pounds of pink-salmon backs, valued at $330. On Cook Inlet 5,700 pounds of coho backs, valued at $285, were smoked.

One of the cannerymen in the Bristol Bay region prepared for his own use a small quantity of smoked salmon in olive oil. The salmon was first smoked slightly, then sliced into thin pieces and put into cans, after which pure olive oil was poured over the product. Tops were then put on the cans without exhausting. A very delicious product was thus obtained. The damp weather in this region will not permit of salmon being smoked and transported to the States uncanned, as it soon molds.

SALMON BY-PRODUCTS.

The utilization of waste fishery products in the salmon-canning industry is a subject which merits thoughtful consideration. Little or no attention was given this matter in Alaska until 1913, when the North Pacific Trading & Packing Co. installed a small plant for the manufacture of fertilizer and oil from the waste products of its cannery at Klawak. This was the first and has been the only plant of its kind operated as a cannery adjunct in Alaska. It appears from reports that its operation has been successful. In 1914 a company designated as the Fish Canners By-Products (Ltd.) built a plant at Ward Cove, a few miles from Ketchikan, and installed the necessary equipment for the manufacture of oil, fertilizer, edible meal, and other products resulting from salmon-canning waste. On account of a late start, because of construction work, this company did comparatively little in 1914, but in 1915 operations were conducted along extensive lines. The plant was enlarged in 1915, and it is understood that it is now capable of handling approximately 200 tons of raw material each day. All of the products manufactured by this company in 1915 were from salmon-cannery offal exclusively. This plant is centrally located in a district where within a radius of 50 miles there are about 20 salmon canneries. Contracts have been entered into with a number of these canneries, and the refuse or gurry is saved and transported by the by-products company to its plant at Ward Cove. The advantage of this to the cannery-man seems obvious, as there is not only a financial return but at the same time sanitary conditions around the cannery are improved; ordinarily the practice is to allow the waste parts of the fish from the canning process to pass through the floor into the water under the cannery, for most of the canneries are built on piles at the water's edge or just within the shore line. It will be seen from the foregoing that there are two types of plants which may be developed in the utilization of waste salmon products: (1) The individual plant located at a cannery and operated incidentally to the chief business of canning salmon, and (2) a central plant to which refuse material from a number of canneries is taken, such plant being given over exclusively to the manufacture of by-products.

From information at present available it would seem that both of these projects in Alaska have been successful. In some cases cannerymen would no doubt prefer to install their own plants, whereas in other instances they would not care to be bothered with a side line of this character, preferring to dispose of the offal to a company organized specially for the handling of such material. Again, in some places the canneries are too widely separated to justify the erection of a central plant, as the expense of collecting the raw material is an important item. In such cases, if use is made of the cannery waste, it will be necessary for the canneries to install the required machinery for reduction purposes.

Extensive investigations along this line have been made by Dr. J. W. Turrentine, of the Department of Agriculture. That department's interest in the matter lies in the fact that it has been studying the problem of developing new sources of fertilizers; also, it has given consideration to the manufacture of food for chickens and cattle from fish scrap. A document setting forth these matters in detail has been issued by the Department of Agriculture.

STATISTICAL SUMMARY.

Consideration under this head is given only to the manufacture of oil and other products from salmon-canning waste. The production of oil and fertilizer from herring will be found elsewhere in this report under the heading of the herring fishery, while the yield of oil and fertilizer in the whale fishery is shown under the discussion of that subject.

Two plants were operated in the by-products industry in Alaska in 1915. The investment totaled $127,879 as against $116,607 in 1914. The number of persons employed in 1915 was 85, all whites, of whom 77 were shoresmen and 8 were transporters. The number of persons engaged in 1914 was 32. There was a distinct gain in the output of this industry in 1915, its value in that year amounting to $40,255, whereas in 1914 it was worth only $6,114.

OUTPUT IN BY-PRODUCTS INDUSTRY IN ALASKA IN 1915.

Items.	Quantity.	Value.
Oil..........gallons..	47,976	$14,227
Fertilizer..........tons..	43	1,305
Edible fish meal..........do....	738	24,723
Total..........	....	40,255

SALMON IN THE YUKON.

Salmon fishing in the Yukon River is confined to operations of limited extent, the object of which is to supply certain demands for local consumption, including the use of salmon for dog feed. The species taken are chinook, coho, and chum salmon. The chief method of capture is by means of small wheels, of which it is estimated that there are 200 in use throughout the entire extent of the Yukon in Alaska. In the lower reaches of the stream the natives use a form of set net instead of the small wheels which are used farther upstream.

INJURY TO SALMON BY BIRDS.

Appreciation of the injury done to salmon and their eggs by water birds leads to the conclusion that a reduction in their numbers in some localities, particularly about the spawning grounds of salmon, is desirable. It is understood that the birds most destructive to salmon and their eggs are gulls and terns.

The law protecting birds in Alaska is covered in the act of June 2, 1902 (32 Stat., 327), as amended by the act of May 11, 1908 (35 Stat., 102), which reads in part as follows:

> From and after the passage of this act the wanton destruction of wild game animals or wild birds, except eagles, ravens, and cormorants, the destruction of nests and eggs of such birds, or the killing of any wild birds, other than game birds, except eagles, for the purposes of selling the same or the skins or any part thereof, except as hereinafter provided, is hereby prohibited.

The desirability of securing some relief from the depredations of the birds injurious to fish life led the Department of Commerce to take up the matter with the Department of Agriculture, under whose jurisdiction the act referred to is administered. That department advised that consideration of the several sections of the act led to the conclusion that the killing of gulls and terns by the officials of the Bureau of Fisheries charged with the protection of spawning grounds of salmon in Alaska does not constitute "wanton destruction" of the birds as prohibited under the law, and that the officials or agents of the Bureau of Fisheries may, therefore, take such action as is necessary to protect the salmon and their eggs on spawning grounds. It was noted, however, that the killing of gulls and terns away from the spawning grounds or when not committing destructive acts would be unlawful, and that all possible care should be taken by the agents of the Bureau of Fisheries to safeguard the birds from unnecessary destruction. Furthermore, the killing should be done only under the regulation and direct supervision of officers of the Bureau of Fisheries.

A number of birds have already been destroyed and it is expected that there will be an expansion of effort along this line in 1916.

DESTRUCTIVENESS OF HAIR SEALS IN THE SALMON FISHERY.

The injury done to salmon by hair seals in southeast Alaska was made the subject of a preliminary investigation by Inspector Walker. The work was taken up largely in connection with other work and could not, under the circumstances, be carried on in an exhaustive way. The following extract from his report is made:

> In southeastern Alaska the damage done by hair seals to salmon is observed mainly at the three principal gill-netting grounds, namely the Stikine, Taku, and the Chilkat Rivers and vicinities. There are at least three reasons for this: First, the seals are in

greater abundance at the large glacial streams, probably because of the greater numbers of fish; second, the water is suited to the use of gill nets for a large portion of the time and this method of fishing furnishes better opportunities to observe the actions of the seals; and third, the gill nets render the fish helpless and easy prey for the seals which soon learn this and frequent the nets.

The distribution of the seals is not, however, confined to these restricted localities but on the contrary they frequent all salt water of the region and at times ascend the streams and rivers in greater or lesser numbers, sometimes becoming quite abundant far up the larger streams, and also occasionally entering fresh water lakes near tidewater. They are to be found in practically every bay into which streams flow and are there in varying numbers from one or two to dozens, depending on the supply of fish.

The study was first taken up at the Stikine River and efforts were made to ascertain in definite figures and percentages the fish damaged by the seals. To best accomplish this it was necessary to visit daily as many as possible of the fishermen and obtain from them the figures as to the total number of fish caught in their nets during the preceding 24 hours, or since last visited, and the numbers positively known to have been damaged by the seals as shown by remnants in the nets. The figures therefore take no account of the numbers of fish entirely removed from the nets, leaving no trace whatever, or none other than a torn net, blood stains, or a few scales. The fish thus lost by the fishermen is not a small percentage, but as no definite figures could be obtained they are entirely ignored other than for this brief mention. The figures are for only a portion of the fishermen operating at the Stikine and for only a few days, and take into account only the damaged fish remaining in the nets. The number of fish consumed by the seals other than those taken from the nets can not at present even be estimated. Some persons have expressed it as their opinion that at least in the vicinity of the larger rivers the seals destroy more fish than are taken by the fishermen. From these limited observations it seems probable that such statements are entirely correct.

The figures given are for king salmon only. From meager information at hand it seems that the other species of salmon are not taken from the nets in such large percentages. Possibly this is because the fish are more abundant, and also by the time the other salmon run the seals have moved up into the rivers away from the fishermen's nets. It is likely though that their diet is composed mainly of salmon whenever those fish are to be obtained.

Through the courtesy of the Columbia & Northern Fishing & Packing Co., of Wrangell, it was possible for the officers of the Bureau to go on the boat that daily visited the fishermen to collect fish, and it was on these trips that much of the statistical information was obtained.

Of a total of 1,184 red-meated king salmon taken in nets visited, 324 were damaged and remained in the nets, a percentage of 27.39+; and of 278 white-meated king salmon caught, 24 were mutilated and remained in the nets, a percentage of 8.63+.[a] These figures fully bear out the assertions of the fishermen that the hair seals prefer the red-meated salmon to the white ones.

According to information received from the fishermen, seals were not as abundant nor as destructive during the time that the above data were collected as they commonly are, so the figures are probably much under the average of the damage by the seals.

There are no such figures as the above to show the seals' work at the Taku and Chilkat Rivers, but by conversing with fishermen and others, and in a few cases by personal observation, it is believed that the damage is much the same as in the Stikine region.

At the Stikine the damage is worst when the nets are placed near the flats or the river mouth and least when far out, and at the other streams the same is true. To keep the losses from seals at a minimum the fishermen work back and forth along their nets almost ceaselessly, day and night, taking out fish as soon as they are seen to strike the net, but even then the seals often beat the fisherman in the race and snatch the struggling fish from in front of him. It is not an infrequent occurrence for the fisherman to be taking out a salmon and have a seal attack the other end of the same fish. In one or two instances fishermen have narrowly escaped being bitten by the savage attacks of the seals on fish that were being taken from the nets. Were it not for the continued efforts of the fishermen to remove the fish from the nets they would have none remaining when it came time to take up the nets.

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[a] The observations were made in the period from May 12, 1915, to May 29, 1915, dates inclusive.

Besides the fish mutilated, the seals occasionally damage the nets by becoming entangled in them. Sometimes the animal is thus drowned, but more often it escapes, leaving a rent in the net from a few meshes to a fathom or two.

Seals frequently enter fish traps and there feed upon the fish, but as a rule they find their way out, although occasionally one is captured.

As to what other fish are taken in considerable numbers by seals remains to be worked out. Seals are at times reported as abundant about the herring schools, and when the eulachon go up the rivers they are there in abundance.

Following the finding of the damage the seals do, there naturally comes the question of how to reduce their numbers most effectively and with the minimum expense. To find some commercial use for the animals and thus cause the prosecution of their destruction to a profitable end would be far preferable to any bounty system or Government hunter. In consideration of this, the writer has several times been in conference with a person who for a time considered undertaking the extensive capture of these mammals provided a reasonable market could be assured, but after some little correspondence, the matter was dropped, as he was unable to find a sufficient market to warrant his undertaking the enterprise extensively. At present the prices for skins and the oil are not sufficient to cause the animals to be hunted determinedly and the few skins that are shipped out are mainly obtained by the natives, some of whom like seal meat for food, and who save the skins when the animals are killed. They make no attempt to save the oil for sale. There are probably more sealskins worked up into moccasins by the natives and sold to tourists or sent to the States than are shipped out as whole skins.

If a bounty system is to be effective, the bounty must be of sufficient size to cause decided efforts to be made to kill the animals, and in order for the bounty to be paid there must be some essential portion of the animal produced as evidence of its having been killed. To accomplish this the animal must be recovered, and in the case of hair seals therein lies the difficulty, for by the methods so far used to kill them in this region only a very small percentage can be recovered. For it to be sufficiently profitable to warrant persons engaging in the work of hunting them for a bounty, it at present seems that the bounty would have to be a very large one unless better methods are found for killing and recovering the animals. By some it is thought that even a small bounty would cause efforts to be made to kill and recover the few possible, counting whatever was made in that way pure gain. If such should prove to be the case, this system would certainly be the proper one to adopt, but in the writer's opinion a system allowing but a small bounty would be ineffective. A desultory hunt for seals might be made if there were a bounty of $3 per head on the animals, but unless the natives and others in this region feel that they can make good wages they prefer to remain idle rather than try to earn what little they can by any legitimate means.

The writer has improved all opportunities to shoot seals with a high-power rifle and, with the assistance of others, a considerable number of the animals were killed, but not one floated or struggled on the surface long enough to permit of its recovery.

Seals breed in Le Conte Bay, near Wrangell, where each year a few natives repair to take females just before the pups are born, as the skins of the unborn pups are prized as well as their flesh. The writer attempted to visit the bay at this time, but the trip was not successful, as the entrance of the bay was entirely blockaded by ice so that the head of the bay could not be reached. At a later date another trip was made with slightly better success. Near the head of the bay, within about half a mile of the face of Le Conte Glacier, seals were found on the ice in considerable numbers. Several were killed in a short time, but not one could be recovered. The young were fairly well grown and were no more easy to kill than the adults. They all soon became wary and kept out of range. An estimate of the numbers in the bay at the time could not be made, as the head of the bay could not be reached because of the ice, and there were doubtless many which were not seen at all. It seems probable that by a further study of the situation in this bay locations on land might be chosen from which considerable numbers might be killed, particularly about the time the young are born. It is not possible to kill them on the ice with clubs in such a place as this, as the ice is broken from the face of the glacier and is extremely irregular in shape and there is nothing in the way of floes or flat pieces of any size on which it is safe to land or even approach closely. It is probable that Le Conte Bay is the principal breeding ground that supplies the Stikine region, and by the adoption of suitable measures to destroy the seals in this bay their numbers on the flats and at the rivers should be greatly reduced and a considerable saving be effected in the salmon fishery.

The supply of seals for the Taku region is probably from breeding grounds near Taku Glacier, and those at the Chilkat and Chilkoot Rivers probably come from Davidson Glacier or one of those in that vicinity, and it is likely that in Glacier Bay are one or more rookeries that in a degree supply the Icy Strait region.

Seals have been reported to breed at a few points in southeastern Alaska away from glaciers, and it may be that at these places they leave the water far enough to render it possible to kill them with clubs or at least make some form of shooting more successful than has so far been experienced. To the present time it has not been possible to visit these places or verify the reports.

At the Stikine the seals are very abundant at times on the flats and at other times they ascend the river to eddies where they congregate in considerable numbers. They are common in the river far above the boundary between the United States and Canada. Possibly a successful way of netting or trapping them in these eddies or in the rivers might be devised. Also suitable points for shooting them when in the eddies might be located.

In the experiments so far conducted in killing the seals high-power rifles with soft-point bullets have been used, but if any considerable percentage of the bodies is to be recovered some other method must be adopted, as these bullets kill instantly and usually tear such a hole that apparently there is not sufficient air remaining in the body to buoy it for the few seconds necessary to pick it up. In addition to the suggestions noted above for further study of the matter, it is desirable to experiment with long-range shotguns shooting heavy shot and also with small-caliber, low-power rifles, neither of which would tear such holes and probably not kill so quickly. Also experiments with hard-point high-power rifle bullets might prove valuable. Other work that should be tried and which it is thought would prove fruitful of results is the locating of all the breeding grounds and ascertaining what methods are best adapted to each, the carrying on of the above-mentioned experiments with various guns and ammunitions, the selecting of points on land for shooting the animals in the water and on the ice in the rivers in the spring, the ascertaining of the percentages of bodies recoverable by the native method of shooting the seals at high tide when over the flats and picking them up at low tide, studying the possibilities of netting and trapping, and some minor ideas that have been suggested or have occurred to the writer.

As a result of another year's work carried on as suggested above it should be possible to determine quite accurately the damage done by seals in southeastern Alaska, the best methods of destroying them, and with some degree of accuracy the probable cost of such work. Further and more accurate determination of the extent of their damage would show the importance of destroying them and the maximum amount which it would be profitable to expend to accomplish this end.

THE HALIBUT FISHERY.

The halibut fishery in Alaskan waters is next in importance to the salmon industry. Although some may regard the salmon industry as having reached that mark beyond which further progress under present conditions may not be particularly great, it is certain that the halibut fishery has by no means approached the maximum of its productivity. Some of the banks in British Columbia waters which for years have yielded a rich return of halibut are beginning to show signs of depletion. It is therefore to waters contiguous to the Alaskan coast that efforts must be directed chiefly in further expansions of the industry. The total production of halibut from Pacific waters northward from Oregon to Alaska in 1915 was approximately 65,000,000 pounds, whereas the banks of the Atlantic produced less than 5,000,000 pounds. On account of the reluctance of fishermen to state definitely the locality from which halibut are taken, because the spreading of such information would invite competition, it is difficult to obtain exact statistics regarding the proportions of the catch from the several regions concerned on the Pacific coast. It is believed, however, that a conservative estimate would place the catch of halibut along the Alaskan coast both in extraterritorial and intraterritorial waters at approximately 40 per cent of the total, or, expressed in figures, a total of more than 25,000,000 pounds in the year 1915. The customs records, however, show only about 15,000,000 pounds of halibut passing through Alaskan ports. This is substantially the amount which is credited to Alaska in the statistical tables appearing elsewhere in this report.

The halibut industry in Alaska is centered chiefly at Ketchikan, where there are two large fish-freezing plants, namely, those of the New England Fish Co. and the Ketchikan Cold Storage Co. The first mentioned is the largest in Alaska. The latter concern was new to Alaska in 1915. Other companies having cold-storage facilities and engaging in the halibut industry in an important way were the Booth Fisheries Co., at Sitka; Juneau Cold Storage Co., at Juneau; Taku Canning & Cold Storage Co., at Taku Harbor; and the Glacier Fish Co., which operated a floating cold-storage plant on the barge *Glory of the Seas*. This concern has heretofore been designated as the Glacier Fisheries Co. It did not, however, send the *Glory of the Seas* into Alaskan waters in 1914, although the vessel was operated at Idaho Inlet in 1913. In addition to the freezing of halibut, this concern, as well as other companies, made shipments of fresh halibut on the regular lines of steamers plying between ports of Alaska and Puget Sound. Many of the halibut schooners taking fish on the banks off the coast of Alaska proceeded directly to Puget Sound or to ports in British Columbia to land their catch.

The opinion expressed by the Bureau several years ago that the opening of the Grand Trunk Pacific Railway to Prince Rupert, British Columbia, would probably divert a considerable portion of the halibut trade from American ports was fully confirmed by developments in 1915. Prince Rupert is located only 90 miles from Ketchikan and unless means are adopted to hold the trade it is undoubtedly true that Prince Rupert will draw a large proportion of the halibut trade now enjoyed by American communities. From an American point of view the importance of the situation may be seen from the fact that during the year 1914 no halibut were landed by American fishing vessels at Prince Rupert, but beginning in March, 1915, and continuing through to the end of the year American vessels landed more than 7,000,000 pounds of halibut at that port, while Canadian vessels landed about 8,000,000 pounds there. It is reported that approximately 80 per cent of the fish caught by Canadian vessels were shipped to American markets. All the American-caught fish landed at Prince Rupert were shipped in bond to American markets, chiefly to the important distributing centers for halibut at Boston and other eastern cities.

The Dominion Government has taken active steps to develop the halibut industry of British Columbia, and chiefly that of Prince Rupert, by an order in council which was issued on March 9, 1915, as follows:

> During the present calendar year foreigners or foreign corporations bringing fresh fish in vessels registered in the United States of America to any port in British Columbia shall be permitted to land such fresh fish at such port without payment of duties and transship the same in bond to any port in the United States, or to sell such fish in bond to such local dealers or dealer as may be properly and duly licensed therefor, under the regulations and conditions in compliance with the bonding requirements (without the right, however, in either instance, to sell in Canada for consumption therein, or otherwise except in bond, any of such fresh fish so landed); and such foreigners and foreign corporations bringing fresh fish in vessels registered in the United States of America to any port in British Columbia, shall be permitted to purchase supplies, and ship crews for such vessels, at any port in the said province of British Columbia, the whole under such regulations and conditions as the minister of customs may determine.

By the terms of this order Canada is enabled to receive the benefits of the American fishing industry, but the market for American caught halibut landed at Prince Rupert or other Canadian ports has not been enlarged, as the use of such fish so landed by American vessels is prohibited in Canada. Various inducements have been held out by the authorities at Prince Rupert to cause American vessels to land their cargoes at that port and to outfit for fishing operations and buy all supplies there. The object thus sought has in considerable measure been accomplished in 1915, as various American companies have been forced to invest money at Prince Rupert in order to obtain their proportion of the halibut trade. A number of American companies have made extensive investments at Prince Rupert and others contemplate doing likewise unless measures are taken very soon to retain the halibut industry in American ports as it existed before the opening of the Grand Trunk Pacific Railway to Prince Rupert.

There is apparently nothing in the present laws or regulations of the United States extending sufficient authority to cope adequately with the situation. Plans are therefore being formulated for the enactment of legislation by Congress to give the necessary protection to the American halibut fishery and particularly to retain for American ports the trade which they formerly enjoyed, and which is now seriously threatened and will undoubtedly be lost, very largely, and go to Prince Rupert and other Canadian towns. It is not only the loss of trade that American towns will suffer, which of itself is of sufficient importance to cause real concern, but it is the more important loss of Alaska citizens who will make their homes in Prince Rupert rather than in towns of southeastern Alaska, notably Ketchikan. This is a loss which Alaska should not be forced to sustain, and unless something is done soon to remedy the situation it will be a distinct setback to the development of that Territory.

The situation is peculiar in that undoubtedly means can be devised whereby not only will the trade be retained to southeast Alaska, but at the same time Prince Rupert may continue to enjoy in considerable measure the benefits of the industry and particularly the Grand Trunk Railway can have the benefit of as much freight traffic as though the fish were landed exclusively in Canada. A simple means of accomplishing this seems to lie in merely requiring that before halibut taken from the waters of the Pacific may be shipped in bond to the United States through Canada they must first be landed at an American port. The adoption of this plan would likely result in the establishment of what might be termed a ferry service between Prince Rupert and Ketchikan. The cost of this probably would be borne largely by the Grand Trunk Pacific Railway, but it does not seem to be a matter of great expense. In fact, it is probable that the establishment of such a service would prove profitable to the Grand Trunk Pacific Railway. Emphasis is laid upon the fact that under the remedy just suggested shipments of halibut to the eastern markets over this railway would continue to be as heavy as under present conditions.

Another subject to which some attention was given in the last months of 1915 is the establishment of a close season for the taking of halibut in Pacific waters. This matter has been advocated by fishing interests and it is anticipated that in the near future steps will be taken to accomplish something definite along this line.

STATISTICAL SUMMARY.

The investment in the halibut fishery in Alaska in 1915 amounted to $2,842,800, which is a slight increase over the investment of $2,744,955 in 1914. The number of persons engaged in 1915 was 1,455 while in 1914 it was 1,406. There has also been an increase in the product, which in 1915 totaled 15,417,789 pounds, valued at $781,011, as against 14,807,797 pounds, valued at $762,757, in 1914. These figures are based in considerable measure upon the returns made through the customs service. The table of products shown below does not include catches made in extraterritorial waters of Alaska which were taken by the fishing vessels directly to Puget Sound or to Canadian ports.

INVESTMENT IN THE ALASKA HALIBUT FISHERIES IN 1915.

Items.	Number.	Value.	Items.	Number.	Value.
Fishing vessels, steamer and power	140	$1,682,000	Fishing apparatus		$80,000
Tonnage	4,070		Shore and fixed property		442,000
Outfit		610,000	Total		2,842,800
Dories	480	28,800			

PERSONS ENGAGED IN THE ALASKA HALIBUT FISHERIES IN 1915.

Races.	Number.
Whites	1,420
Natives	35
Total	1,455

PRODUCTS OF ALASKA HALIBUT FISHERIES IN 1915.

Products.	Pounds.	Value.
Halibut:		
Fresh	9,747,634	$533,898
Frozen	5,589,864	244,423
Fletched	80,291	2,690
Total	15,417,789	781,011

THE COD FISHERY.

VESSEL FISHERY.

Unsettled market conditions early in 1915 did not augur well for the cod industry. Preparations, however, were made to carry on the business in Alaskan waters along the same lines followed in the previous year. The vessels engaged in offshore fishing were outfitted and dispatched in March and April from home ports at San Francisco and on Puget Sound. The run vessels made several trips to the Alaskan shore stations to take north supplies and return with the catch. The fishing vessels operating both in the vicinity of the Shumagin Islands and in Bering Sea had a successful season although weather conditions were unfavorable part of the time. The shore stations did not do as well as in some seasons past. Along toward the end of the year market conditions improved somewhat.

The concern heretofore listed as the Matheson Fisheries Co. is now designated under the name of J. A. Matheson. Early in the year the Alaska Codfish Co. added the schooner *Maweema* (392 tons) to its fleet of fishing vessels. On March 12, 1915, this company suffered the loss of the power schooner *Nonpareil* (31 tons) which went ashore on Unga Island, Alaska. No lives were lost. This vessel was used in connection with the company's shore stations in Alaska. It is reported as having been the first power schooner engaged in the Alaskan cod fishery. It was sent north from San Francisco about five years ago.

At its cannery at King Cove the Pacific American Fisheries put up experimentally a few cases of canned cod. The fish were packed in 1-pound flat cans and were treated in a manner quite similar to the ordinary method of canning salmon. Cans opened several months later showed the product to be firm and white and in every way justifying the conclusion that the experiment was a success. It is believed that this field is worthy of further development and exploitation.

The following vessels were operated in connection with the cod fishery in 1915:

ALASKA COD FLEET, 1915.

Names.	Class.	Net tonnage.	Operators.
Azalea	Schooner	327	J. A. Matheson, Anacortes, Wash.
Fanny Dutard	do	252	Do.
Wawona	do	413	Robinson Fisheries Co., Anacortes, Wash.
Alice	do	220	Do.
John A.	do	235	Pacific Coast Codfish Co., Seattle, Wash.
Charles R. Wilson	do	328	Do.
Maid of Orleans	do	171	Do.
Fortuna	do	128	Northern Codfish Co., Seattle, Wash.
Glendale	do	281	Alaska Codfish Co., San Francisco, Cal.
Allen A. [a]	do	266	Do.
City of Papeete	do	370	Do.
Maweema	do	392	Do.
Nonpareil [b]	Power schooner	31	Do.
Ottilie Fjord	Schooner	247	Pacific States Trading Co., San Francisco, Cal.
Bertha Dolbeer [a]	do	230	Do.
Sequoia	do	324	Union Fish Co., San Francisco, Cal.
Vega	do	233	Do.
Galilee	do	328	Do.
Golden State [a]	Power schooner	223	Do.
Pirate	do	30	Do.
Union	do	9	Do.
Union Flag	do	7	Do.
Martha	Schooner	14	Do.

[a] Transporting vessel.

[b] Wrecked Mar. 12, 1915.

SHORE STATIONS.

Shore stations were situated as follows: Alaska Codfish Co.—Unga, Squaw Harbor, and Kelleys Rock, on Unga Island; Companys Harbor and Murphys Cove, on Sannak Island; and Dora Harbor, on Unimak Island. Pacific States Trading Co.—Northwest Harbor, Herendeen Island. Union Fish Co.—Pirate Cove, Popof Island; Northwest Harbor, Herendeen Island; Pavlof Harbor and Johnson Harbor, on Sannak Island; Unga, on Unga Island; and Dora Harbor, on Unimak Island. Also, there were several smaller independent shore-station operators in the Shumagin Islands region, including John H. Nelson, at Squaw Harbor, Nick H. Johnson, and A. Komedal.

STATISTICAL SUMMARY.

The investment in the Alaska cod fishery in 1915, including both offshore and shore operations was $570,990, as compared with $623,921 in 1914. There was, however, an increase in the number of persons engaged, there being 747 employed in 1915 as against 677 in 1914. This is a gain of 70 persons for 1915. Figures for the shore stations in the States are not included.

The products of the Alaska cod fishery in 1915 aggregated 14,195,775 pounds, valued at $390,199. The figures for 1914 were 15,045,378 pounds, valued at $438,208, thus showing a decrease in quantity for 1915 of 849,603 pounds and in value of $48,009.

INVESTMENT IN THE COD FISHERY IN ALASKA IN 1915.

Items.	Number.	Value.	Items.	Number.	Value.
Vessels:			Apparatus:		
Power vessels	4	$38,000	Gill nets	1	$40
Tonnage	269		Hand lines	3,613	1,948
Launches under 5 tons	11	4,634	Cash capital		212,827
Sailing vessels	18	181,288	Value shore stations		116,203
Tonnage	4,769				
Boats, row	453	15,800	Total		570,990
Pile drivers	2	250			

PERSONS ENGAGED IN THE ALASKA COD FISHERY IN 1915.

Occupations and races.	Number.	Occupations and races.	Number.
Fishermen: Whites	648	Transporters:	
Shoresmen:		Whites	33
Whites	47	Grand total	747
Natives	19		
Total	66		

Products of Alaska Cod Fishery in 1915.

Products.	Pounds.	Value.
Vessel catch:		
Salted cod	10,553,175	$291,479
Tongues	18,800	1,380
Total	10,571,975	292,859
Shore-station catch:		
Salted cod	3,603,000	96,300
Stockfish	8,400	420
Shore-station catch—Contd.		
Tongues	12,400	$620
Total	3,623,800	97,340
Total:		
Salted cod	14,156,175	387,779
Stockfish	8,400	420
Tongues	31,200	2,000
	14,195,775	390,199

THE HERRING FISHERY.

There is no phase of the fisheries of Alaska which seems to have had less attention commercially in proportion to its potential worth than the herring fishery. The waters of Alaska abound with a high grade of herring of a species differing so slightly from that of the Atlantic coast that to the casual observer there is no real difference. Notwithstanding this abundance there has been no development of the commercial fishery in Alaska in any way approaching the possibilities along this line. Herring have been utilized chiefly in three ways: (1) As bait in the halibut fishery, (2) pickled for food, and (3) in the manufacture of oil and fertilizer. There have also been some shipments of dry-salted herring in bulk to the Orient, but prohibitive freight rates have made such ventures unprofitable. The development of the pickled-herring trade of Alaska has not been as successful as might have been the case if greater care had been exercised by the fishermen in handling the pack. There has been a disposition not to sort the herring with sufficient care, and the result has been unfavorable to the trade. Most of the herring have been caught by means of purse seines, which has resulted in the taking of all sizes of the fish, but if gill nets of suitable size mesh were used, as is largely the case in the herring fishery in European waters, only the larger sized herring would be caught. This would do away with much of the labor in sorting the fish when preparing them for pickling. It is realized that when herring are taken for halibut bait, either to be sold in a fresh condition or to be frozen for future use, it is more profitable to use purse seines.

On account of the unprecedented demand for herring in Europe, resulting from war conditions, the importations of Norwegian and Holland herring into the United States fell off in 1915, in consequence of which the market has been strong for American herring. As a result, shipments of pickled herring from Alaska in 1915 were greater than in the previous year, and it is reported that the quality and size of the fish were much improved over that of former years. Under present conditions it is believed that a good grade of Alaska herring running about 600 fish to the barrel should be worth at least $12 a barrel. Smaller fish, grading down in size to about 1,000 per barrel, are worth approximately $9. The advent of the Pacific Mild-Cure Co., a new concern in the Alaska field, had much to do with improving the pickled-herring industry in 1915. This company's operations were conducted chiefly in the vicinity of Petersburg.

As for many years past, the Alaska Oil & Guano Co. operated its plant at Killisnoo, where herring were utilized in the manufacture of oil and fertilizer. This company has expanded its operations somewhat to include the sale of herring for bait to halibut vessels, and has also pickled some herring for food. The season's catch of herring was upward of 28,000 barrels. It is likely that before long legislation will be enacted prohibiting the use of herring or other food fish in the manufacture of oil or fertilizer. Should such action be taken a reasonable amount of time ought to be given the company in which to adjust its affairs.

STATISTICAL SUMMARY.

According to the statistics, the herring fishery in Alaska in 1915 shows an increase over the previous year. The total investment in 1915 was $211,640, as compared with $203,045 for 1914. The number of persons engaged in 1915 was 158 as against 144 in 1914. The value of the products in 1915 was $155,579, as compared with $123,217 in 1914. The most notable feature of the gain in 1915 was the increased pack of pickled herring for food. There was also a considerable increase in the amount of herring frozen for bait. The production of both oil and fertilizer manufactured from herring declined in 1915.

INVESTMENT IN THE HERRING FISHERY OF ALASKA IN 1915.

Items.	No.	Value.	Items.	No.	Value.
Vessels:			Pile drivers	2	$1,000
Steamers and launches	4	$22,000	Purse seines	12	15,000
Tonnage	163		Cash capital		90,000
Launches under 5 tons	1	1,500	Shore and accessory property		74,000
Boats, row and seine	32	2,040			
Lighters and scows	6	6,100	Total		211,640

PERSONS ENGAGED IN THE ALASKA HERRING FISHERY IN 1915.

Occupations and races.	Number.	Occupations and races.	Number.
Fishermen:		Shoresmen—Continued.	
Whites	99	Japanese	7
Japanese	4		
Total	103	Total	50
		Transporters: Whites	5
Shoresmen:			
Whites	32	Grand total	158
Natives	11		

PRODUCTS OF ALASKA HERRING FISHERY IN 1915.

Products.	Quantity.	Value.
Herring:		
Fresh, for bait .... pounds..	2,727,000	16,561
Frozen, for bait .... do....	2,646,300	19,300
Pickled for food[a] .... barrels..	6,656	78,238
Fertilizer .... tons..	619	15,475
Oil .... gallons..	130,028	26,005
Total	....	155,579

[a] Includes 308 barrels, valued at $2,457, pickled in central Alaska.

INQUIRY REGARDING WASTE OF HERRING.

The natives of southeast Alaska are accustomed to collecting considerable quantities of herring eggs for food purposes. The eggs being of an adhesive character become attached to algæ and other vegetation and to rocks, and since they are deposited in shallow water close to shore their collection is a simple matter. To facilitate gathering the eggs the natives supplement the supply of algæ or other natural collecting agencies by placing boughs of trees in the water. To ascertain something as to the extent that the use of herring eggs might be considered as having an adverse effect upon the maintenance of the supply of herring an investigation was begun by Inspector Walker in 1914 and continued in 1915. After the work was undertaken it became apparent that other factors were of greater importance in their bearing on the destruction of herring, and the investigation was accordingly expanded to cover the various important enemies of the herring in southeast Alaska. The matter of suggesting remedies for the evils was also given attention.

The two more important spawning regions for herring in southeast Alaska are in the vicinity of (1) Fish Egg Island, an island lying across the mouth of Klawak Inlet, west coast of Prince of Wales Island and near the village of Craig, and (2) Sitka. The investigation was carried on in both of these regions.

The following extract from Mr. Walker's report is made:

> At Craig the herring spawned from March 27 to April 1, inclusive, in 1914, and in 1915 from March 10 to 20, inclusive. The west and north shores of Fish Egg Island with Klawak Reef on the north form about 95 per cent of the spawning ground. These slope quite gradually from high tide level to some distance below low tide level so that a large beach is exposed at low tide. About 50 per cent of the total spawning grounds are thus exposed at every low tide to the depredations of those enemies operating above the surface of the water. In no place were the eggs found to have been deposited in water more than 10 feet in depth at low tide, and from that level to about 2 feet of high tide level. Much of this area from about low tide line to a considerable depth is covered with a luxuriant growth of a large-frond species of seaweed. It is upon this and the smaller algæ and grasses as well as upon some of the rocks that the eggs naturally adhere. The large fronds, together with

the stipes, are frequently many feet in length and float upon the surface of the water or at a comparatively slight depth. Thus their relative position to the surface remains the same at all stages of the tide. But few of these are entirely stranded at low tide so that eggs deposited on them are subject for the most part to disturbance only from those enemies operating in the water. Frequently these large fronds are covered on the upper side to a thickness of one-half inch with the eggs, and it is such as these that the natives select for drying.

When the herring eggs are first deposited they are surrounded by a sticky, gelatinous coating that causes them to adhere to any object they touch, and the natives have found that by placing the green branches of hemlock on the beach at low tide, where they will be on the spawning grounds when the tide comes in, the eggs will become attached to them, thus making it more easy to collect and dry the eggs, as they dry more readily on hemlock than on the seaweed.

The only preparation the eggs undergo for preservation is drying, which is accomplished by hanging the limbs and twigs in trees or on ropes or wires in the sun and wind, and the fronds either by hanging over wires or strings or by laying them on canvas on the ground. A small quantity of eggs on the small mosslike algæ is sometimes collected, but owing to the matting down of the mass it dries but slowly and much difficulty is experienced in preserving the eggs. They quickly spoil unless dried rapidly. Also, when on this algæ they are not so desirable for food.

Practically the entire native population of Klawak—about 300—collected eggs at Craig in 1914, and in addition there were natives from Shakan, Hydaburg, Kake, Killisnoo, and many other places. A total of over 500 natives participated in the work at Fish Egg Island and vicinity. Many of the natives who came in their own power boats lived aboard them, but the entire west shore of the island was lined with the camps of those who had come in canoes or by other means. At the north end of the island proper is a small village that is occupied only for a short time each year, during the period for taking and drying eggs. Most of the natives who had come in canoes were laden down with their spoils when ready to depart, and large quantities of both fresh and dried eggs were shipped on the three weekly trips of the mail boat *Uncle Dan*, plying between Wrangell and the west coast region of Prince of Wales Island. The shipments were consigned to Shakan, Hydaburg, Sulzer, Waterfall, Wrangell, and other points. Many of those who lived at Klawak carried fresh eggs direct to their homes, where they dried them. Those who had come from a distance in power boats filled every conceivable bit of space with the fresh and dried eggs, and frequently towed canoes, also loaded with the food.

A box filled with fresh eggs on seaweed or hemlock, weighing about 50 pounds, sells for about $2. About half the weight is of the vegetation. All the eggs from a single herring would be but a handful, and when dried but a tablespoonful. The natives who are fortunate enough to be able to take eggs exert every effort to obtain all they can possibly handle, so that they may have plenty to sell and trade to other natives not so fortunate. Thus it is at once apparent that an incredible number of eggs are sacrificed.

At Sitka the conditions were studied in the same manner and found to be quite similar to those at Craig, except that the spawning grounds are in small isolated coves in the many islands, rocks, and reefs of the region; and as the beaches are very steep, a smaller percentage of the eggs was exposed than at Craig and there was no large area covered by spawn, as at Craig. The period of spawning in 1914 in the vicinity of Sitka lasted almost three weeks. A large portion of the native population of Hoonah, Killisnoo, Kake, and other villages, was busily engaged there in collecting the eggs and shipping or drying them.

The eggs are shipped in boxes of the size indicated above, or in burlap sacks which hold about the same quantity. On three weekly trips of the steamer *Georgia*, leaving

Sitka on the dates given, the following numbers of packages of eggs were shipped to the places indicated:

Date.	Packages.	Destination.	Date.	Packages.	Destination.
1914.			1914.		
Apr. 1	1	Chatham.	Apr. 6	14	Douglas.
Do	12	Killisnoo.	Apr. 12	1	Chatham.
Do	2	Tenakee.	Do	19	Hoonah.
Do	12	Hoonah.	Do	3	Haines and Klukwan.
Do	2	Funter.	Do	19	Juneau.
Do	7	Douglas.	Total.	114	
Do	20	Juneau.			
Apr. 6	2	Hoonah.			

This makes a total of 114 boxes and sacks shipped on the three trips of the one steamer. The above figures show an incalculable number of eggs destroyed, but far greater numbers were carried away in the boats of the natives who had come from other villages to secure them. Of these there are no figures available, nor is there any way of estimating the amounts kept in the village and vicinity for future use or the amounts consumed fresh, but on every hand were to be seen both old and young natives devouring the eggs, fresh and cooked. By the natives they are considered a great delicacy, but to the average white person they are wholly insipid. At the Sheldon Jackson school for natives at Sitka the demands for these eggs became so insistent that the management was finally prevailed upon to serve one or more meals of them to satisfy the children.

The fresh eggs are eaten either without cooking of any kind or after having been placed for a few minutes in slightly salted boiling water. If the eggs have been dried, the entire frond or branch is boiled for a few minutes in slightly salted water. In this case the eggs come off and sink to the bottom of the vessel, after which the vegetation is removed by picking out the larger pieces and skimming away the floating trash.

Although the operations of the natives destroy great quantities of herring eggs, their destruction is insignificant in comparison with the natural enemies and the seiners, the destructiveness of both of which is shown in the following portion of this report.

The most destructive of the enemies of the herring are the myriads of water fowl of the region. As the time of spawning approaches and the herring school up in the vicinity of their grounds, these winged hordes congregate in the vicinity in vast flocks, best described as clouds of birds, and remain there the entire time that the herring are about.

The greatest numbers of birds observed or reported were at Craig, which is not far from their breeding grounds. From the time the fish first appear in the region, usually early in the winter, the birds begin to collect. During this time they feed on the adult herring, and by the time the herring are ready to spawn many of the migratory birds have arrived to augment the flocks. They prey on these fish from daylight until dark for the entire time and practically without cessation, often becoming so gorged as to be unable to fly; but as soon as the food becomes somewhat digested they are filling themselves again. When they are thus gorging themselves, it is a common sight to see a gull take half a dozen adult herring in as many minutes, if the fish are crowded or confined so as to be unable to escape.

During the spawning season these vast voracious flocks feed almost exclusively on the eggs of the herring. At Craig 19 birds were collected and their stomachs examined to ascertain the contents. Of this number there were only three not gorged to their utmost capacity with the eggs, from the crop to the pylorus, and usually even the mouth was full to overflowing. In only one or two cases were there fish in the stomach, and these had probably been picked up dead on the beach when the birds were after eggs. Some of the stomachs contained small quantities of miscellaneous marine matter, but this was probably picked up by accident in the search for eggs.

Of the total number of birds in the vicinity of Craig observed to be feeding on the herring or eggs, the following are the estimated percentages of the various species:

SPECIES OF BIRDS PREYING ON HERRING.

Species.	Percentage of each species.	Species.	Percentage of each species.
Ducks:		Gulls—Continued.	
Surf scooter	15	Bonaparte's gull	10
White-winged scooter	15	Miscellaneous	15
Old squaw	5		
Miscellaneous	5		55
	40	Shore birds and others	5
Gulls:		Total	100
Glaucous-winged gull	30		

At Sitka the bird life was much the same except that the relative numbers were somewhat different, the gulls being in still greater majority. Such large flocks were not to be seen here owing to their being scattered over a much greater area, covering many miles of coastline and intervening waters. Stomachs of seven birds taken here were in practically the same state of engorgement as those taken at Craig and contained about the same class of food material in much the same proportion.

An actual count of the herring eggs contained in the stomach of one unidentified species of gull, probably a glaucous winged, gave the surprising number of 5,378 eggs remaining in such a state of preservation as to be easily distinguishable. This stomach was not a fair sample as it was not filled nearly as full as were most of those taken. The average stomach contained at least twice this number of eggs and many held fully three to four times as many. There is no doubt but that a single gull, or other bird of similar size, when feeding on herring spawn will consume at least 10,000 eggs at a single meal. Birds digest their food so rapidly and the herring eggs are so readily digested that the quantities consumed are almost incredible. It is probable that in some cases not less than 50,000 eggs are consumed in a single day by individual birds, as they eat almost continuously during the daylight hours.

At Fish Egg Island and vicinity about 50 per cent of the eggs are above water at low tide, and of those exposed I have good reason to believe from my observations that not more than 5 per cent escape destruction by the birds. Of those below water a considerable number are taken by the ducks, grebes, loons, cormorants, and others not confined to operations on the surface.

From the time the fish approach the surface at the outer coasts, all during their stay in the inland waters, and until they return to the open ocean they are at no time free from the attacks of these voracious enemies.

It seems desirable to reduce losses from the natural enemies, that man may profit by what is saved from them. To best accomplish this, the most effective and practical remedy that occurs to the writer is to remove completely all protection from the birds that do the damage, save that their nesting sanctuaries might be retained; and at the time of spawning place one or two men well supplied with guns and ammunition to shoot and frighten away the birds from these areas. At such a spawning ground as at Craig it would not be difficult or expensive to protect the eggs quite fully by this means from the ravages of the birds for the few days they are exposed to their depredations before hatching. In such a region as Sitka and vicinity it would be slightly more difficult and expensive, but not prohibitively so, for the herring in that region do not spawn simultaneously at widely scattered points.

The white man's most direct and needless destruction of the herring is the seining of them on their spawning grounds and vicinity when spawning or about to spawn.

This, however, is much easier to control than any of the preceding. During their spawning period and for some time previous, they are valueless as food for human consumption and are used only for bait or in the manufacture of oil, fertilizer, chicken feed, or similar preparations. At this time they are much less wary than usual and are readily seined in large quantities. In any of these operations not only the individual fish are sacrificed, but the eggs that are to produce the supply of fish for future years are lost as well. Such destruction can not do otherwise than decimate the numbers of herring when taken in conjunction with the other destructive agencies at work. Frequently when seining is done on the spawning grounds the seine and boat become a mass of spawn. Thus not only the herring and the eggs remaining in them are destroyed, but many of the eggs that have already been deposited are ruined.

The freezing and preserving in cold storage of herring for bait is not an expensive or difficult operation, as is shown by the fact that it is at present done to a considerable extent. The taking of herring or the disturbing of their spawn should be prohibited in southeastern Alaska each year from March first to May first. It is during this period that all spawning occurs in southeastern Alaska, so far as the writer has been able to ascertain. At the same time the retention of herring in pots or inclosures for more than five days after the commencement of this suggested close season of each year should also be prohibited. Under present conditions it is not infrequent that during their spawning season thousands of barrels of herring are retained in pots where they deposit their spawn, practically all of which is lost.

The Craig and Sitka regions are the two more important spawning grounds, and represent the two types of grounds, i. e., the single large areas and the many small isolated coves and bights, the former exposing a large percentage of the eggs at low tide and the latter comparatively few. Besides these grounds, there are about 20 other points in southeast Alaska at which it is known that herring have at times spawned. Of these a few are regular resorts, but the majority are not used annually, and a few only rarely. At all of these grounds the conditions are essentially the same as those of either the Craig or Sitka regions, particularly as regards the natural enemies and the operations of the natives. It is quite probable that more detailed work would develop other spawning grounds.

Under the discussion of the natural enemies and the operations of the seiners, methods have been proposed for remedying the existing conditions, but no comment has been made on the advisability of prohibiting the natives from taking eggs, as the other two factors are of so much greater importance in the destruction of the herring that it seems advisable to recommend first the correction of those evils. As was shown under the discussion of the natives' operations, they destroy considerable quantities of spawn, but, as compared with the natural enemies and the seiners, the natives' work is not of great importance. In the writer's opinion the natives should be prohibited only after provisions are made for checking the ravages of the birds and the prohibition of seining during March and April of each year.

The Bureau is now giving careful consideration to the formulation of measures having in view the abatement as far as practicable of those agencies which are destructive to the herring fishery.

THE WHALE FISHERY.

SHORE STATIONS.

The whale fishery in Alaska in 1915 was confined to the operation of two shore stations. One of these plants was that of the United States Whaling Co., at Port Armstrong, in southeast Alaska, while the other was operated by the North Pacific Sea Products Co., at

Akutan, in western Alaska. The latter concern was listed in 1914 under the name of the Pacific Sea Products Co. A number of additions and improvements have been made at this plant. Both of these stations had a successful season, the total catch of whales numbering 470, as compared with a total of 482 in 1914. Although the European market for some of the whale products was demoralized on account of the war the domestic demand has been such that a much better financial return was obtained than in 1914.

The method of killing whales is by means of small steamers equipped with a muzzle-loading gun which shoots an explosive bomb into the animal, from which a line leads to powerful winches on the forward deck of the vessel by which the animal is finally drawn alongside. It is then pumped up with air to keep it from sinking and is towed to the shore station, where it is hauled out on a platform by means of winches and cut up. Every part of the animal is used, different grades of oil being obtained from the blubber, from the meat, and from the bones, while two grades of fertilizer or meal are secured, one from the meat and the other from the bones.

Five steamers were used in killing whales in Alaska in 1915, the *Star I* (133 tons), *Star II*, and *Star III* (97 tons each) being operated by the United States Whaling Co., and the *Unimak* and *Kodiak* (99 tons each) being operated by the North Pacific Sea Products Co. Heavy weather retarded the operations of both plants in the earlier part of the season. It becomes a matter of great difficulty or even an impossibility to hit a whale when there is much of a sea running.

The United States Whaling Co. experienced two disasters. Early in the season some of the buildings were destroyed by fire, at a loss of about $4,000, and in December a severe gale damaged a number of the buildings to the extent of approximately $6,000.

In connection with its operations the North Pacific Sea Products Co. gave employment to 17 natives, which number included all available natives on Akutan Island as well as some from other settlements. While there is considerable work that the natives are not able to perform, at least until they have received instruction for some time, the company has found them very satisfactory in certain lines of work for which they are well qualified. This is a gratifying situation and anything that can be done in the way of giving natives employment will be of great benefit to them as their lot is ordinarily a hard one and their means of making a living are generally quite meager in the more isolated sections of western Alaska.

OFFSHORE WHALING FLEET.

The operations of the offshore whaling fleet, which a few decades ago were of great importance in Alaskan waters, have practically ceased. The only offshore whaling vessel of this fleet which is reported as having made a cruise in 1915 is the steamer *Belvedere* (339 tons), which left Seattle in the spring on a voyage to Siberian waters to obtain whale and walrus products. The vessel returned in the fall. Last year three vessels of the fleet made whaling voyages, but with indifferent success, and four of the vessels were laid up in Oakland Creek, where they had been for several years. All of these ships were either continued in idleness in 1915 or were diverted to uses other than in the whale fishery.

STATISTICAL SUMMARY.

The total investment in the shore whaling industry in Alaska this year was $1,453,850, as compared with $1,456,649 in 1914, and the number of persons employed in 1915 was 204, as against 225 in 1914. The value of the products in 1915, however, shows a notable gain, being $381,750, as compared with $291,099 in 1914. The total number of whales taken by the shore stations in 1915 was 470, while in 1914 the catch was 482. Although the foregoing shows a decrease both in investment and number of whales taken, the increased value of the product may be explained by the great advance in prices obtained as a result of conditions incident to the war in Europe.

WHALES TAKEN IN SHORE OPERATIONS IN 1915.

Species.	Number.
Finback	239
Humpback	153
Sulphur-bottom	53
Sperm	25
Total	470

INVESTMENT IN SHORE WHALE FISHERY IN ALASKA IN 1915.

Items.	Number.	Value.	Items.	Number.	Value.
Vessels:			Pile drivers	2	$600
Steamers	5	$240,000	Value of plants		708,000
Tonnage	525		Cash capital		430,000
Barges	1	10,000	Wages paid		64,650
Tonnage	1,149				
Launches under 5 tons	1	400	Total		1,453,850
Lighters and scows	2	200			

PERSONS ENGAGED IN SHORE WHALE FISHERY IN ALASKA IN 1915.

Races.	Number.
Whites	123
Natives	17
Japanese	64
Total	204

PRODUCTS OF ALASKA SHORE WHALING OPERATIONS IN 1915.

Products.	Quantity.	Value.
Whale oil..........gallons..	876,500	$295,000
Sperm oil..........do....	101,800	38,000
Fertilizer, meat..........tons..	1,385	46,000
Fertilizer, bone..........do....	110	2,750
Total..........	....	381,750

MINOR FISHERIES.

TROUT.

Several of the trouts are widely distributed in Alaska, including the Dolly Varden, rainbow, cutthroat, and steelhead, all of which go to make Alaska very attractive from the angler's point of view. The Dolly Vardens are particularly abundant, and together with steelheads are utilized in a small way commercially. So numerous are the Dolly Vardens that a much greater expansion of this industry is not only possible, but would be a decided benefit in the way of helping the salmon industry, as the Dolly Vardens destroy large numbers of the eggs and young of salmon.

The total value of trout products in Alaska in 1915 was $3,420. This shows a decline from the previous year when trout to the value of $5,758 were utilized.

PRODUCTS OF THE ALASKA TROUT FISHERY IN 1915.

Section and species.	Fresh.		Frozen.		Canned.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Cases.*[a]	*Value.*
Southeast Alaska:						
Dolly Varden..........	22,670	$2,297	990	$41	17	$38
Steelhead..........	....	....	9,051	340	....	....
Total..........	22,670	2,297	10,041	381	17	38
Western Alaska: Dolly Varden..........	....	....	....	....	176	704
Grand total..........	22,670	2,297	10,041	381	193	742

[a] Each case contains forty-eight 1-pound tall cans.

BLACK COD.

The black cod (*Anoplopoma fimbria*), a fish almost unknown to the Pacific coast markets until a few years ago, continues to grow in favor, as is evidenced by the increase over the previous year in the quantity shipped from Alaska in 1915, which amounted to 142,550 pounds as compared with 87,573 pounds in 1914. Except for its darker color the black cod resembles the true cod which has long been marketed, but it belongs to an entirely different family. Its most striking characteristic is the unusual amount of oil in the flesh, in consequence of which a rich article of food results. A favorite method of preparing black cod is to smoke certain parts lightly, particularly the backs. This is done chiefly after the fish are landed at Puget Sound ports, for the product as it comes from Alaska is either in a fresh, frozen, or pickled state.

The fish are taken incidentally in the halibut fishery, and as a rule are caught on those trawls which are set at greater depths, as the black cod apparently confines its habitat more exclusively to deeper water than does the halibut. Until four or five years ago most of the halibut fishermen when lifting their trawls threw away all black cod immediately after they were taken from the hooks. At the present time, however, the price obtained makes it desirable to bring in these fish along with the halibut.

SHIPMENT OF BLACK COD FROM ALASKA WATERS IN 1915.

Products.	Pounds.	Value.
Fresh	57,394	$1,688
Frozen	46,176	1,194
Pickled	38,980	1,089
Total	142,550	3,971

ATKA MACKEREL.

In January, 1915, the department issued a permit authorizing A. C. Goss to fish for Atka mackerel in the vicinity of Attu Island, Aleutian Islands Reservation, and to market the product. It was stipulated in the permit that all work in connection with the taking of the fish and their subsequent preparation for market should be done by Aleuts or Indians who were residents of the reservation. Fishing for Atka mackerel was carried on by Mr. Goss at Attu Island on June 19, July 1, and July 10, and 10 barrels of 200 pounds each were taken each day. Native labor was used and the fish were taken by means of jigs. The gear employed consisted of 1 schooner, valued at $3,000; 3 boats, at $100; jigs, $5. Eighteen natives were employed and the number of fish taken was 7,035. The total product was 30 barrels, valued at $300.

A few barrels of the fish after having been pickled were shipped to San Francisco, as a sample, in an endeavor to introduce the product and if possible secure financial aid. The fish were repacked at Unalaska and an examination showed them to be fat and in excellent condition.

It is stated that the fish congregate in large schools off Attu Island and remain there the entire summer. The natives say that they are also found there in the winter season.

It has been suggested that experimentation might develop a way of making excellent caviar from the eggs of these fish.

MUSSELS.

For a number of years the Bureau has been directing attention to the food value and wholesomeness of sea mussels, a product found in abundance along our coasts, but one which has not been in much favor, notwithstanding that mussels are held in as high esteem in Europe as are oysters in the United States. At many places along the coast of Alaska mussels in every way suitable for human food are to be obtained in quantities with but little effort. Opportunity is hereby taken to suggest the possibilities of this field.

CRABS.

A few crabs are obtained from time to time in southeast Alaska, chiefly in the Petersburg district, and are shipped to Puget Sound. Crabs are also consumed locally to a certain extent. Although not particularly numerous so far as present information goes, it is believed that crabs are to be obtained in sufficient quantities to justify the development of a modest fishery. According to customs records, 14,395 pounds of crabs valued at $713 were shipped from southeast Alaska in 1915.

CLAMS.

At various places in Alaska clams of excellent quality are to be found. In some sections, notably in the Prince William Sound region, they are to be had in sufficient abundance to warrant the operation of a cannery. Such a plant, the first of its kind in Alaska to be listed as a clam cannery, will be operated at Cordova in 1916. Clams have also been obtained in considerable quantities in the vicinity of Klawak, in southeast Alaska. Some canning of clam products has occurred in past years at the salmon cannery of the North Pacific Trading & Packing Co., at Klawak. No shipments of clams from Alaska were reported to the Bureau in 1915. There was, however, some local use made of clams, particularly by the natives.

FUR-SEAL INDUSTRY.

PRIBILOF ISLANDS.[a]

GENERAL ADMINISTRATIVE DUTIES.

The Pribilof Islands, in Bering Sea, are the breeding grounds of the North American fur-seal herd, and these islands are the only places where the seals come to land at any time. So long as pelagic sealing is prohibited these islands naturally become the base of any operations having to do with the taking of skins. And whether skins are taken for commercial purposes or not, the need of affording protection to the seals while on the islands from raiders, the maintenance of the Government property, and the obligation on the part of the Government to support the native inhabitants, who in times of noncommercial killing of seals are deprived of their principal means of obtaining a livelihood (that of taking sealskins), make it necessary for the Department of Commerce to carry on active operations there at all times.

PURCHASE AND TRANSPORTATION OF SUPPLIES.

Some of the necessities of life for the approximately 300 native inhabitants of the Pribilof Islands are secured there or from the surrounding waters. There is an abundance of seal meat, and a limited quantity of fish may be secured. In addition wild birds may be taken at certain times of the year and their eggs are utilized occasionally in the summer. Some driftwood is available for fuel. But with these exceptions, practically all the items of food, fuel, clothing, and materials for shelter have to be provided for the maintenance of these people.

SUPPLIES.

Early in the year a limited quantity of supplies was purchased at Seattle and forwarded to the Pribilofs on the schooner *Bender Bros.* Delivery at the islands was effected April 1, 1915.

As has been the custom in previous years, it was planned to ship the bulk of the annual supplies in the summer. From requisitions submitted by the agents at the islands, schedules, 31 in number, were prepared of the various classes of supplies desired. These schedules were printed and distributed among various merchants and supply houses in New York, Boston, Chicago, San Francisco, Seattle, and other places for the purpose of securing competitive bids. It was provided that proposals would be received for one or more schedules complete, that each schedule would be considered separately, and that no proposal would be considered for separate items in a schedule. It was also provided that bidders should select the points at which they chose to make deliveries. With two or three exceptions the most favorable bids received proposed to make deliveries at Seattle, and that point was accordingly made the base for assembling the supplies.

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[a] The manuscript reports of H. C. Fassett, A. H. Proctor, and others have been drawn on freely in the preparation of this section.

For transporting the supplies to the Pribilofs the Navy collier *Saturn* was secured. The vessel left Seattle on August 24 and arrived at San Francisco on the return trip September 28.

Natives at Unalaska having expressed their desire to be permitted to furnish the salted and dried fish which would be needed at the Pribilofs both for human consumption and for fox food, and investigation having disclosed that terms advantageous to the department could be made with them, it was decided to secure the required supplies of this character from them. The natives performed their agreement in a highly satisfactory manner and the Bureau is pleased to have been able to contribute in a practical way to their means of securing a livelihood. It is hoped that similar arrangements may be made for the year 1916.

The total cost of supplies of every nature purchased for the Pribilof Islands during the calendar year 1915 was $45,315.82.

PERSONNEL.

The statutory officers and employees on the Pribilof Islands during the calendar year 1915 were as follows:

St. Paul Island: Agent and caretaker, Harry C. Fassett; storekeeper, E. M. Ball, succeeded by Robert H. Bishop; school-teachers, Mr. and Mrs. G. Dallas Hanna, succeeded by Mr. and Mrs. George Haley; physician, William B. Hunter.

St. George Island: Agent and caretaker, A. H. Proctor; school-teacher, George Haley, succeeded by Arnold C. Reynolds; physician, William M. Murphy, succeeded by Henry P. Adams.

Mr. Bishop reached St. Paul Island April 1, relieving Mr. Ball, who returned to field work in central Alaska. Mr. and Mrs. Haley were transferred from St. George Island to St. Paul Island in September. Dr. Adams and Mr. Reynolds reached St. George Island to take up their respective duties in September, and in the same month Mr. Fassett, Dr. Murphy, and Mr. and Mrs. Hanna returned to the States. Mrs. Haley rendered assistance as a temporary employee, in teaching on St. George Island prior to her going to St. Paul Island; after her departure from St. George her work there was continued by

Mrs. A. H. Proctor. In September Harry J. Christoffers, an assistant agent in the Alaska service, reported at St. Paul Island to relieve Agent Fassett during the latter's leave of absence.

NEW REGULATIONS.

Definite regulations in regard to the landing and use of intoxicating liquors on the Pribilof Islands were promulgated by Department of Commerce Circular No. 257, dated March 1, 1915. The regulations are as follows:

The Department of Commerce is charged by law with the administration of the Pribilof Islands. In order to promote the moral, mental, and physical welfare of the native inhabitants, who are the wards of the Government, the Department has adopted the following regulations regarding the delivery and use of intoxicating liquors, which regulations supersede any that may heretofore have been issued by the Department or the Bureau of Fisheries:

1. The agent on each island shall be the sole custodian of all Government supplies of alcohol or alcoholic liquors thereon, and shall be responsible for the proper use thereof. He shall at his discretion give out the same as requisitioned by the responsible employees, and shall keep a permanent record of the issuance of each lot, stating the person to whom issued, the kind and quantity, and the purpose for which intended.

2. The giving of intoxicating liquors to the natives of the Pribilof Islands, except as medicine and in religious ceremoneis, is positively prohibited under all circumstances. In view of the example which the Department considers highly desirable for its representatives to set for the native inhabitants of the islands, the prescribing of alcohol as a medicine is regarded with disfavor and as being rarely if ever indispensable. When in the opinion of the official physician on either island it is necessary to administer an alcoholic liquor as a medicine, he shall in each case make a permanent public record thereof, stating the kind and amount required, the name of the patient, and the nature of the disease or condition requiring such treatment.

3. The making of "quass" or other alcoholic drink by the natives is prohibited, and the agents and other officials of the Department will take all necessary steps to discourage and prevent this practice. Natives who, after due warning, continue to make or use such liquors will be properly disciplined. The agents are authorized to withhold from such natives all supplies from which quass or other intoxicating beverages can be made, and, when necessary, to send offenders away from the islands at the first opportunity.

4. Under no circumstances are any alcoholic liquors supplied by the Government to be used for the personal purposes of employees.

5. All requisitions for alcohol or alcoholic liquors intended for public medicinal or scientific purposes shall be submitted by the agents and approved by the Commissioner of Fisheries.

6. All alcoholic liquors requisitioned for the purpose of the Russian churches on the islands shall be paid for by the church authorities and shall, before shipment, receive the written sanction of the proper church officials, transmitted through the Department of Commerce. The agents will deal with any abuses which may result from the improper use by natives of alcoholic liquors consigned for the purposes of the Russian churches.

7. No alcohol or alcoholic liquor of any kind shall be landed on the Pribilof Islands except by authority of the Secretary of Commerce or the Commissioner of Fisheries and with the knowledge of the respective agents. Officers commanding Coast Guard, naval, fishery, or other Government vessels which may visit the islands are requested to make no delivery of alcohol or alcoholic liquor except official consignments, accom-

panied by bills of lading, which have been placed on board by responsible officials of the Department of Commerce or specifically ordered by proper authority. Commanding officers are expected to assure themselves of the contents of all packages for the seal islands received on board or taken ashore from their vessels, and will permit no packages containing unauthorized articles to leave the ship. They will also forbid the giving of alcoholic liquor to natives who may visit their ships. The agents will take proper precaution against the unauthorized landing of liquor from merchant or other privately owned vessels which may visit the islands and against the obtainment of liquor thereon by the natives.

William C. Redfield,
Secretary.

NATIVES OF THE PRIBILOF ISLANDS.

The native inhabitants of the Pribilof Islands consist of the intermixture of Aleuts, taken there in the days of Russian control, with peoples of Russian and other nationalities. Few, if any, to-day are of pure Aleut blood. Socially, these people have but little intercourse with the outside world. A few leave the islands from time to time to take up their abode elsewhere and occasionally a bride is introduced from some other Alaskan community. Some make occasional visits to Unalaska. A number of the older children go from time to time to the Salem Indian Training School at Chemawa, Oreg.

SUPPORT.

Opportunities presented to the people for making a living are extremely limited. Formerly their chief occupation was the taking of fur-seal skins, and after the islands were leased in 1870 this work secured to them a comfortable living. With the falling off in the take of skins it became necessary for the Government to make appropriations for their support. The present appropriations for the Alaska service of the Bureau of Fisheries provide funds for the furnishing of food, fuel, clothing, and other necessities of life for the natives; provision is made also for a number of employees whose services are very largely taken up with their care, namely, two physicians, three school-teachers, and one storekeeper. In addition the agent and caretaker on both St. Paul and St. George Islands gives considerable attention to matters of a supervisory character.

In exchange for the supplies furnished the natives by the Government they are expected to perform such services as may be required. The work consists principally in taking and preserving seal and fox skins and caring for and maintaining the Government property on the islands.

HEALTH.

The isolation of St. Paul and St. George Islands makes it necessary for the Government to employ a physician for each island and to provide medicine and equipment suitable for the resident communities. A special effort was made to meet more fully the needs of the physician on St. Paul Island in respect to supplies in 1915, and it is expected that a similar plan will be followed for St. George Island in 1916.

St. Paul Island.—A report of the physician for the period from January 1, 1915, to September 1, 1915, shows that during this period 683 cases were treated. Of these, 649 recovered, 30 showed improvement, and 4 died. One death was from chronic pulmonary tuberculosis, 1 from meningeal tuberculosis, and 2 (infants) from accidents.

It was felt that improved conditions involving regular hours, out-of-doors work the year round, and the employment of mind and body in useful activities were being reflected in the general health of the natives.

As evidence of improving health conditions on the island the physician records the following interesting observation:

> Twenty-five per cent of the people on St. Paul have scrofulous scars, indicative of tubercular adenitis. The average age of this number is 25 years, while 85 per cent are above 10 years of age. I have had only one case since my arrival in July, 1914. This shows that living conditions are gradually getting better and tuberculosis—especially this form which, I think, is usually primary to the pulmonary form—is gradually disappearing.

The island hospital was opened on January 1, 1915, and down to September 1 five operations had been performed there. All were successful but one, the unsuccessful case being that of a man from the U. S. S. *Prometheus*, who was in a practically hopeless condition when brought ashore.

Twice a week during February, March, and April instruction was given native girls in nursing. They were shown the organisms which caused various diseases and taught the use of antiseptics and other means of prevention and cure of disease. They were instructed in the care of the sick; in the value of cleanliness, proper diet, bathing, fresh air, and sunshine; how to prepare various surgical dressings; how to use the clinical thermometer and to keep the clinical chart. They were also given an elementary course in physiology, anatomy, materia medica, and hygiene. They were present and assisted at operations and showed a natural ability for nursing not far exceeded by trained nurses in the States. It is believed that much may be expected of them when given suitable opportunities.

Subsequent to the landing on the island of a party of workmen from the U. S. S. *Prometheus* for making repairs and improvements to the Navy radio station, certain observations were made that are of considerable interest, and the following extract in regard thereto is taken from the physician's report:

> An interesting fact, and one that proves its contagiousness, is that the ordinary "cold" dies out during the winter to return on the first ship reaching the island. On July 4, 1915, the U. S. S. *Prometheus* arrived. * * * On July 12 an epidemic of

> influenza broke out, first among the native workmen, reached its height July 19, when 38 people were on the sick list, and began to clear up about July 26. Very few escaped the disease. There were no deaths caused directly by this disease and only one—a case of chronic pulmonary tuberculosis—caused indirectly by it. However, it brought out quite a bit of latent tuberculosis. * * * What was considered as only a "bad cold" among the robust men of the Navy proved to be an epidemic of influenza in all its forms, with the usual complications and sequelæ, among the native inhabitants of the island.
>
> I would suggest that all future working parties not only have a thorough physical examination by the resident physician, but be quartered in their own tents, a good distance from the village, and be guarded in such a way that they will be kept entirely away from the natives at all times.

The physician called attention to the need of a better water supply for the village, of larger and better houses, and of many desirable changes and improvements which would be conducive to better health conditions.

St. George Island.—The report of the physician for the fiscal year ended June 30, 1915, showed that the general health of the community had been good. Most of the cases treated had been of gastro-intestinal and pulmonary character. Monthly inspections were made of the natives' houses and the surroundings, and the sources of water supply were also inspected from time to time as deemed necessary. Sanitary conditions, with the exception of overcrowding in the houses, were satisfactory. During this period there were five births. One death occurred, that of an infant, from inanition.

WATER SUPPLY.

Almost every person who has visited the Pribilof Islands has spoken of the inadequate water supply. The situation on St. Paul is much less satisfactory than on St. George and will be discussed first.

St. Paul Island.—The present water supply on St. Paul Island is derived chiefly from two small wells, one about three-eighths and the other about five-eighths of a mile from the village near the eastern shore of the salt lagoon. Although it is possible to get along after a fashion with these arrangements, other means ought to be taken to provide a good supply of fresh water. The present necessity for husbanding the supply of water makes it almost impossible at times for the natives to keep themselves or their homes in proper condition. At one of the wells the Navy Department has installed a small gasoline engine and pump, which lifts water to two 20,000-gallon tanks on the hill above the village. These tanks were built two or three years ago, but last winter was the first time that the service was satisfactory. From the tanks water is piped to the village and to the radio station. The tanks and pipe line belong to the Bureau, but the Navy Department attends to the matter of pumping, in return for which it has the privilege of using water needed at the radio station.

Apparently the best and most economical way of improving the water supply at St. Paul Island is to install a concrete reservoir of approximately 500,000 gallons capacity on Telegraph Hill about a mile from the village. A reservoir 100 feet in diameter and 8 feet deep would be about of this capacity. Telegraph Hill is approximately 200 feet high, and water could be pumped from the ice-house pond, about 300 yards distant, into the reservoir and thence be distributed to the village through a wooden-pipe line. This pipe-line should be at least 5 inches, preferably 6, in diameter and would afford a good pressure of water in every part of the village. Hydrants could be placed at several important centers and adequate fire protection would thus be assured. For lifting water to the proposed reservoir on Telegraph Hill, it is believed that a small gasoline-engine pumping plant would be most satisfactory.

St. George Island.—Much less trouble with the water supply has been experienced on St. George than on St. Paul, though it is by no means what it ought to be. The main supply is from two wells located about an eighth of a mile from the village. There is also a line of 1¾-inch iron pipe extending to a small fresh-water lake about a quarter of a mile from the village. The lake appears to be about 3 acres in extent and is said to be 4 feet deep. This pipe-line is in the form of a siphon. It is owned by the natives, having been installed about 10 years ago and paid for by them. There is no complaint as to the quantity of water that may thus be obtained, except during the winter, when the line freezes up, but the quality is such that it is not suitable for drinking. This objection can undoubtedly be overcome readily by the installation of a suitable filter at the intake at the lake. The cost of such a filter would probably be only a few hundred dollars. The pipe-line should be extended to other parts of the village. It might be well also for the Government to acquire ownership of the present pipe-line, thus removing any possible claims to which the natives might feel justly entitled in future management of the water-supply system. Certain changes could be made without great expense so that the line would not freeze in the winter.

Improvements to the pipe-line system as herein suggested appear to constitute the chief step necessary to put the water supply of St. George on a proper basis. It might also be advisable to dig one or two additional wells.

SCHOOLS.

The Bureau has during the year made special efforts to improve educational methods upon the islands and to instruct the children and also the older people along lines which will be of practical use to them and thereby enable them to bring themselves into the enjoyment of such comforts, necessarily limited at the best, as conditions and circumstances permit. Efforts have been made to introduce phases of manual training. While facilities are limited as compared with those available in the States, it is hoped that the efforts put forth may in time bring results well worth while.

St. Paul Island.—The 1914–15 session on this island was continued through May and limited work was continued by the junior teacher into July. The 1915–16 session was begun in September.

The extended use of English by the adults, particularly the men, who have found its use increasingly necessary in the performance of their daily tasks, has had a gratifying effect upon the children, stimulating them to greater efforts. The policy of requiring every child old enough and strong enough to play about the village streets to attend school has been adhered to strictly. It has not been possible, however, to instruct the younger children for more than half a day at a time, owing to limited classroom facilities. With the parents using English to a greater extent than ever before, and with the encouragement for its extension in the playing of games among the people generally, as at croquet and baseball, a desire to learn the language has been rapidly developed by the children.

Formerly the natives were inclined to be ashamed to speak English, though proud of such Russian as they might know. Not many of them really knew very much of the latter tongue, but a parish school kept by the local priest, at which the Russian language was the principal topic of study, was attended by every child in the village. The result was that such mental effort as was expended in language study was much more likely to be devoted to Russian than to English. This school was abolished in the summer of 1914, and it has not since been reopened.

The women of the village, who usually represent their families in the purchase of supplies at the store, have been encouraged to write their weekly orders in English.

The boy-scout movement was inaugurated among the schoolboys in the spring of 1915. It was enthusiastically taken up and will be extended and developed as rapidly as circumstances permit. The written reports submitted by the older boys in regard to their observations on the seals, sea lions, foxes, birds, and other life of the island were corrected in the classroom by the teacher, then rewritten and submitted to the agent to form part of the island records. The fact that the agent received these reports stimulated the boys to their utmost efforts both in the matter of closer and keener observations and in their composition and preparation.

The abolition of the use of interpreters by the officers of the station in their relations with the natives, both individually and collectively, has been of great benefit. Each person now exerts every effort to understand as many English words as possible, and the extension of the vocabularies of many of the adult natives has been remarkable.

The hillside near the junior school was terraced off in the fall of 1915 so as to make a spacious yard wherein the children of that school are allowed to play, but while so engaged they are allowed to use none but English words. A playground in the lower street of the village, where children may play during the day and the men secure recreation after working hours, was prepared with the idea of extending the use of English along similar lines.

The preparation of leather made from the throats or gullets of seals formed part of the instruction of the older boys, some of whom became quite proficient in this work. This leather is used in the manufacture of card cases, reticules, and other fancy articles which make attractive souvenirs of the island, and are rapidly disposed of to the occasional curio hunter who visits the islands.

Basket making from grasses found on the island was continued by the children of both sexes in the senior school, but the enthusiasm with which this work was followed in 1914 was not as pronounced in 1915. There was, however, sufficient progress made by a number of the children to warrant further endeavors in this direction.

Manual training in several lines, particularly carpentry, blacksmithing, tinkering, masonry, etc., are highly desirable in the education of the boys, while sewing, nursing, domestic science, etc., should be special studies to be followed by the girls. It should be borne in mind, however, that manual training to be of any real value demands competent instructors, and provision should be made not only for the employment of such persons but for their housing and comfort. Buildings and equipment for the training school will also need to be provided.

It was noted with much satisfaction that the boys who returned to St. Paul from the Salem Indian Training School at Chemawa, Oreg., in the summer were very proud of their ability to converse fluently in English and to read the current magazines and papers. It was also noticed that the younger men and older boys seemed considerably impressed by the very evident superiority of the Chemawa boys, and it is believed that the best interests of the islands will be served by encouraging every boy to go to the training school as soon as he shall have become eligible. The sending out each year of the boys and girls of proper age, should result in a steady return of a more highly trained class of natives than is ever likely to be produced on the islands. It is noticeable, too, that the drills and probably also the more varied diet enjoyed at the Chemawa school result in a superior physical development.

Referring to the youngest pupils, satisfactory results are not to be expected at present. Limited classroom facilities and lack of equipment are the principal drawbacks. As they grow older the children seem to take more interest in the school work and their advancement is then more rapid. A feature of instruction inaugurated in the spring of 1915 was a sort of civil catechism. The children were asked to tell their names and ages, the names of their parents, the names of the various officials, what they studied at school, and, according to their capacity for understanding, facts concerning the islands and the more common physical surroundings and phenomena.

Possibly the school term should be extended to the end of June, and during the vacation of two months one teacher should be required to call all school children in the village into the classroom once each week. The idea of this is to keep them under discipline and to prevent as far as possible their forgetting many things which usually escape their minds during the four months' vacation.

St. George Island.—The 1914–15 school year opened September 26. As a result of the school building having been enlarged, the interior remodeled, and other improvements made, a comfortable and attractive room was available for the school work. Regular visits were made to the school by the physician, and matters of sanitation were given attention. The personal cleanliness of the children and the care given to their teeth were carefully watched. While the usual courses of primary and common school studies were not lost sight of, special effort was made to so ground the children in the use of the English language that they will use it in their everyday life outside the schoolroom, a condition which does not now obtain.

Some of the difficulties encountered in the matter of giving instruction to the children are indicated by the following extracts from a report submitted by Mr. and Mrs. George Haley for the school term ended May 29, 1915:

> One of the greatest obstacles in the progress of the pupils here is the fact that they do not speak English. With one or two exceptions, English is spoken in none of the homes, so when the child comes to school at the age of six years his vocabulary is usually limited to the words, "good-by," "yes," and "no." It is not difficult for a child to acquire a working knowledge of a foreign tongue under the proper conditions. Many of the children of the foreign-born citizens of the United States hear only their native tongue in their homes; but when they enter the public schools not only the language of the school but the language of the playground is English, and the playground is where the child gets the greater part of his practice in speaking. It is in free conversation that one learns to *think* in a foreign tongue. Such children usually are desirous of speaking English—it may be with no higher motive than because "the others do"—and the parents encourage progress in English, feeling that whatever line of work the children follow after leaving school it will be an aid in their advancement. Here the conditions are very different—the medium of communication of the playground is Aleut, so as soon as the threshold of the school building is passed there is no attempt to speak English. Then apparently the parents feel no interest in their children speaking English. It may be that they see no advantage in it.
>
> The textbooks in use are standard books, but they do not always meet the needs of this school. The primary reading book often lacks interest because it relates to that which has never come into the child's experience; for example, the child whom the author had in mind is enthusiastic over "the *robin* that builds its *nest* in the *elm tree*,"

but for the Pribilof Islands child this presents too many new concepts. The same obstacle has to be met when the pupil comes to the textbook in arithmetic. The problems do not apply to the practical situations in the pupil's daily life. Then in an arithmetical problem every word is significant, but the pupil's knowledge of English is insufficient to enable him to comprehend the conditions of the problem, so he is doubly handicapped.

From the same report the following extract is quoted, as being illustrative of the particular methods of instruction employed and suggestive of additional lines of instruction which might be followed to advantage:

> Although the usual line of primary and common school studies has not been lost sight of, a special effort has been made in the way of English conversation and composition. Certain set English sentences that are in daily use in the pupil's concrete experience have been used as a drill and care has been taken as much as possible to actually *see* the nouns and *act* the verbs before the sentence has been constructed; for example, "Open the box and put the pencil in it." The box and the pencil are shown the pupil, the names pronounced and repeated, the words "open" and "put" are acted by the teacher, then by the pupil. Finally the whole sentence is acted, spoken, written, and read. Objects familiar to the children and animal and plant life of the island have been made subjects of the language lessons both for oral and written work.
>
> Some games have been taught the children in the hope that the English words used would become common in their undirected plays. When the weather permitted, a short walk was a part of the daily program for the little ones, during which time an endeavor was always made that the conversation should be in English, thus names of out-of-door objects and actions have been acquired without a conscious effort. Singing has been taken up twice a week, and since the words have been memorized the children's English vocabularies have been increased considerably. When one sings in a foreign tongue, he unconsciously acquires the correct pronunciation. During the last of the spring months nature lessons have been given, not only that the children might have some knowledge of animals and plants of the island but also as a means of cultivating the power of observation.
>
> Observing the defects of the older pupils has helped in learning the needs of the younger ones. They are very self-conscious, having an abnormal fear of making a mistake. They understand English much better than they can speak it; pupils who have been in school seven or eight years frequently write a request rather than to speak it.
>
> The employing of the concrete and practical can not be over emphasized; i. e., actual measurements of cloth, paper, boards, and land areas. Many of the pupils can glibly say that 9 square feet equals a square yard, but do not know how to find the area of the school floor or even to recognize the square yard marked out on the floor. A set of liquid and dry measures is useful in the schoolroom.
>
> The only reading that the children have heard from babyhood until they enter school is the intoning of both priest and parishioners at the Russian church. This monotonous, nerve-racking drawl is only with difficulty broken down and this is done by conversational methods. We must admit that in reading the older ones are almost beyond our control to remedy.
>
> The temptation is perhaps to neglect the beginners in favor of the older pupils, but in no school would this method be more erroneous than here.
>
> The narrowness of the pupils' horizon and incidentally that of the parents could be considerably enlarged by means of a moving-picture apparatus. An evening's entertainment could be arranged at the Native Library and a descriptive talk given. Some pictures of an amusing nature might be presented, for the lives of these people

are very devoid of pleasures, and also pictures showing the life of our large cities, country life, men actually at work in our manufactories, views of our large harbors with their shipping from all parts of the world, and anything that would show the many resources and industries of our great country.

Valuable assistance was rendered by Mrs. George Haley in the way of giving instruction to the younger children and in teaching sewing. This work was later taken up by Mrs. A. H. Proctor, Mr. and Mrs. Haley having been assigned to St. Paul Island for the school year 1915–16.

The 1915–16 school year began the early part of September. At the end of the month there were under the direction of the senior teacher 10 boys and 14 girls. The junior teacher also began giving elementary instruction to 23 of the younger children, ranging in age from 3 to 6 years.

Attendance at Salem Indian Training School.—From time to time some of the children desire to attend the Salem Indian Training School at Chemawa, Oreg., and all practical encouragement is given to them by the Bureau. In 1915 Alexai Emanof, Ouliana Fratis, Agrifina Fratis, and Martha Fratis went to San Francisco on the Bureau's supply ship and later enrolled at the school at Chemawa.

In the year 1915 the following listed children from the Pribilof Islands were in attendance at this school:

NATIVES OF THE PRIBILOF ISLANDS IN ATTENDANCE AT THE SALEM INDIAN TRAINING SCHOOL, CHEMAWA, OREG., 1915.

Names.	Attendance began.	Remarks.
George Lekanof	August, 1914	From St. George Island.
Constantine Lestenkof	do	Do.
John Hanson	July, 1911	From St. Paul Island, returned there September, 1915.
Alexai Emanof	October, 1915	From St. Paul Island.
Agrifina Fratis	do	Do.
Ouliana Fratis	do	Do.
Martha Fratis	do	Do.
Nicholas Orloff	July, 1911	Entered from St. Paul Island, but no longer a resident of the Pribilofs.
Alexander Melovidov	do	Do.

SAVINGS ACCOUNTS.

The matter of transferring the funds in the natives' savings accounts to the custody of the United States Commissioner of Fisheries as trustee, noted in the report of the Alaska Fisheries and Fur Industries in 1914, was effected except in respect to one account. It is expected that the custody of this account will be transferred in 1916. The funds were transferred from the Union Trust Co., of San Francisco, to the Washington Loan & Trust Co., Washington, D. C. The following table shows details in regard to the account with the latter company:

PRIBILOF ISLANDS NATIVES' SAVINGS ACCOUNTS IN THE CUSTODY OF THE UNITED STATES COMMISSIONER OF FISHERIES, AS TRUSTEE, 1915.

Date of deposit.	Funds of—	Amount deposited.	Date of deposit.	Funds of—	Amount deposited.
1915.			1915.		
Mar. 10	Bogadanof, Agrifina	$174.24	Mar. 10	Melovidof, Alexander	$254.18
10	Bourdukofsky, Apollon	219.90	May 24	Merculief, Dosofoy	32.57
10	Bourdukofsky, Peter	143.19	Mar. 10	Merculief, Joseph	98.98
10	Diakanof, Auxenia	21.70	May 24	Merculief, Macar	32.57
May 24	Emanof, Alexai	248.77	24	Merculief, Marian	32.57
Mar. 10	Fratis, Agrifina	78.19	Mar. 10	Merculief, Paul A	32.57
10	Fratis, Akalina	460.80	May 24	Merculief, Terrenty	32.57
May 24	Fratis, Martha	78.19	Mar. 10	Oustigof, Peter	107.24
Mar. 10	Fratis, Ouliana	78.19	10	Pankof, Agrifina S	308.28
10	Galanin, Febronia	44.30	10	Philomonof, Mary	99.81
10	Galanin, Mary	271.70	10	Prokopioff, Peter	92.60
10	Gromof, Ouliana	847.04	10	Rookavishnikof, Elizabeth	44.03
May 24	Hanson, John	219.07	10	Shane, Michael	70.43
Mar. 10	Hopof, Nekita	54.00	May 24	Stepetin, Marina	44.02
10	Kozlof, Parascovia	165.16	Mar. 10	Swetzof, Zoya	136.37
10	Krukof, Julia B	165.16	10	Zacharoff, Emanuel	36.78
10	Lestenkof, Dimitri	151.84			
10	Lestenkof, Michael	266.11		Total	5,143.12

The funds are carried by the bank as one account and the records as to the amount due each native are kept by the Bureau. Interest is paid on the account at the rate of 3 per cent per annum and is credited on the 1st days of January and July of each year for the preceding periods of six months. The interest is calculated upon the monthly balances, which method, owing to the inactivity of the account, secures virtually the same results as if average daily balances were used as the basis of computation.

On July 1, 1915, interest was credited to the account in the amount of $46.90, and through the end of December, 1915, withdrawals had been made to the amount of $196.80, leaving a balance of $4,993.22. On January 1, 1916, this balance was increased to $5,068.61 by an interest credit of $75.39 for the preceding six months.

CENSUS.

A recapitulation of the census of native inhabitants of St. Paul Island as of June 30, 1915, is as follows:

Total native population, June 30, 1914	192
Births during year ended June 30, 1915	10
Departures during year ended June 30, 1915	2
Deaths during year ended June 30, 1915	6
Dropped from census (married to white)	1
Total native population , June 30, 1915	193

A recapitulation of a similar census for St. George Island follows:

Total native population, June 30, 1914	117
Arrivals during year ended June 30, 1915	2
Births during year ended June 30, 1915	5
Temporary departures during year ended June 30, 1915	2
Deaths during year ended June 30, 1915	1
Total native population, June 30, 1915	121

From the foregoing it will be noted that the total native population of the Pribilof Islands on June 30, 1915, was 314.

FUR-SEAL HERD.

KILLING OF SEALS.

The killing of seals during the calendar year 1915 was limited, in accordance with law, to the number necessary to supply food for the natives of the Pribilof Islands. The number killed on St. Paul Island was 2,666, and on St. George Island 1,281, a total of 3,947 for both islands.

RECORD OF FUR SEALS KILLED ON ST. PAUL ISLAND, ALASKA, IN THE CALENDAR YEAR 1915.

Date.	Hauling ground driven.	Number.	Date.	Hauling ground driven.	Number.
1915.			1915.		
Jan. 2	Sivutch (Sea Lion Rock)	137	Aug. 7	Northeast Point	1
May 21	Northeast Point	1	10	Gorbatch and Parade Ground	70
26	do	1	Oct. 21	Reef	87
28	do	1	22	do	[c] 1
June 1	Reef	87	25	Northeast Point	1
2	Northeast Point	1	26	Tolstoi and Reef	151
10	Reef	199	Nov. 2	Northeast Point	1
10	Northeast Point	1	3	Reef	120
16	do	1	9	Northeast Point	264
22	do	1	11	do	119
30	do	1	13	do	89
July 2	Gorbatch and Parade Ground	65	15	Reef	100
3	do	[a] 8	16	Zapadni	31
6	Northeast Point	1	19	Northeast Point (north side)	64
14	Gorbatch and Parade Ground	77	23	Reef	120
14	Northeast Point	1	Dec. 3	Northeast Point	87
21	do	1	3	Tolstoi	45
24	Gorbatch and Parade Ground	55	21 22	do	87
27	Northeast Point	1			
29	Reef	111			
30	do	310		Total	2,666
Aug. 2	do	[b] 2			
5	do	165			

[a] Found dead after drive of July 2.
[b] Found dead after drive of July 30.
[c] Found dead after drive of Oct. 21.

RECORD OF FUR SEALS KILLED ON ST. GEORGE ISLAND IN THE CALENDAR YEAR 1915.

Date.	Hauling ground driven.	Number.	Date.	Hauling ground driven.	Number.
1915.			1915.		
June 17	East Reef	34	Aug. 2	North	1
20	Zapadni	2	2	Zapadni	1
24	North	25	7	East Reef	21
27	Zapadni	2	7	Zapadni	2
July 1	North	96	10	North	52
5	Staraya Artel	53	10	Zapadni	8
7	East and East Reef	81	Oct. 20	North	64
9	North	112	27	Staraya Artel	21
16	Staraya Artel	84	Nov. 9	North	59
17	East	168	10	East	12
18	Zapadni	1	17	Staraya Artel	45
22	do	1	19	North	54
22	Staraya Artel	60	22	Staraya Artel	32
23	East and East Reef	123			
30	North	66		Total	1,281
30	Zapadni	1			

CENSUS OF THE FUR-SEAL HERD.

The policy of taking an annual census of the fur-seal herd of the Pribilof Islands, based on actual count of certain components of the herds and on estimates of others, was continued. The census was taken by G. Dallas Hanna, assisted by other officers of the fur-seal service.

The following table shows in condensed form the components of the herd in 1912, 1913, 1914, and 1915, the four years which have ensued since the cessation of pelagic sealing:

GENERAL COMPARISON OF RECENT CENSUSES OF THE SEAL HERD.[a]

Class of seals.	1912	1913	1914	1915
Breeding bulls	1,358	1,403	1,559	2,151
Breeding cows	81,984	92,269	93,250	103,527
Idle bulls	113	105	172	673
Young bulls (chiefly 5-year-olds)	199	259	1,658	11,271
4-year-old bachelors	100	2,000	9,939	15,848
3-year-old bachelors	2,000	10,000	13,880	18,282
2-year-old bachelors	11,000	15,000	17,422	23,990
Yearling bachelors	13,000	20,000	23,068	30,307
2-year-old cows	11,000	15,000	17,422	23,990
Yearling cows	13,000	20,000	23,067	30,306
Pups	81,984	92,269	93,250	103,527
Total	215,738	268,305	294,687	363,872

[a] The 1915 census is not strictly comparable to those of previous years, different percentages of death rate having been assumed.

The following extract is from Mr. Hanna's report on the fur-seal census in 1915:

> The census of fur seals on the Pribilof Islands in Bering Sea was taken in 1915 in the same manner as in the three preceding years. Bulls in charge of harems, idle bulls, and hauling ground seals were counted at the height of the breeding season, July 17 to 21. The pups, young of the year, were counted between July 27 and August 7.
>
> The basic figures of present census calculations must necessarily be the births of this and preceding years. By deducting from the number of births the number killed and the number lost from natural mortality, those classes which can not be accurately counted because not all are on land at any one time, may be estimated with a fair degree of accuracy. The percentage of loss from natural mortality is an unknown factor in the calculations and must be chosen with due regard to all conditions and available data. During the years when the natural losses at sea were augmented by a very large and uncertain pelagic catch, the percentages were estimated at 50 per cent loss for the first year, 15 for the second, 10 for the third, and 5 per cent each for the fourth and fifth years. Experience has shown that even then, these figures were very conservative. Since the pelagic catch has been eliminated, these percentages are found wholly inadequate to give a close approximation to the actual numbers of the seals in the different categories. Data derived in 1915 show that the loss while the seals are away from the islands is nearly 50 per cent for the first three years. This figure is accordingly applied in the estimation of numbers of bachelors present this year. The lagging effects of pelagic sealing on the herd have prevented the obtaining of any data previous to 1915 which would warrant a change from the old percentages

of loss. This year more than half of the seals in the herd have never been subjected to pelagic sealing and the changes in many percentages are marked. In 1916 it will probably be possible to formulate laws on increase of the herd, proportions of the different classes which are ideal and desirable, and the number which may be killed from the herd for their skins, which will be effective as long as natural conditions prevail.

Pups.—The majority of the pups are born between June 15 and July 25. A few of them begin to swim the first week in August, and the number increases rapidly thereafter until at the end of the month of August practically all have taken to the water, and some move along the shore from the rookery a mile or more.

By the end of September the young have assumed the silvery gray pelage and go on long trips around the islands. They become very fat in September and October and many of them then exceed the yearlings in weight. They leave the vicinity of the islands in the latter part of November and early in December. On January 2, 1915, among approximately 1,000 seals on Sea Lion Rock, not one was of the young of the previous summer.

Each year a few albino pups are born. Their eyesight is defective as a rule and they usually die at sea. Three were noted among the pups born in 1915, one on each of the following rookeries: Lagoon, Morjovi, and Vostochni. The flippers of albinos are light pink to chocolate color, and the fur is very light yellowish to tawny. The eyelids are white, in some cases, and black in others, but the iris is usually pink. They occasionally grow to maturity. In 1915 three were observed. An albino cow with a black pup was observed on Hutchinson Hill at Northeast Point. A 5-year-old albino bull roamed about from one rookery to another. A 3-year-old albino male was killed on St. George Island and preserved as a specimen by A. H. Proctor.

The pups on St. Paul Island were counted July 28 to August 3, and on St. George Island August 5 to 7. Because of the number of very young pups and pregnant cows it is not advisable to begin the count before July 28, and because the pups are taking to the water in considerable numbers after August 7, it is desirable to complete the count before the close of that day. But whether each rookery is counted on the same date as in preceding years makes no difference in the result as it would in the harem counts.

In making the count the methods of the 1914 investigation were followed. A. H. Proctor and George Haley assisted on St. George Island on two days. Gunner A. J. Holton, United States Navy, rendered valuable assistance on the Reef Peninsula and at the Northeast Point rookeries on St. Paul Island. The same natives were employed, as nearly as possible, from day to day in order to profit by their experience.

The pups in each breeding mass were kept separate, corresponding to the masses of harems as plotted on the charts during the harem count. The average harem in each breeding mass is thereby obtained.

DISTRIBUTION OF PUPS AT THE PRIBILOF ISLANDS IN 1915.

Rookery.	Date of counts.	Living pups.	Dead pups.	Total pups.
ST. PAUL ISLAND.				
Kitovi	Aug. 3	2,429	46	2,475
Lukanin	do.	1,926	28	1,954
Gorbatch	July 29	6,882	96	6,978
Ardiguen	do.	623	9	632
Reef	Aug. 1	14,506	244	14,750
Sivutch	July 28	4,479	56	4,535
Lagoon	July 29	387	7	394
Tolstoi	Aug. 3	11,501	122	11,623
Zapadni	Aug. 2	8,548	192	8,740
Little Zapadni	do.	5,586	96	5,682
Zapadni Reef	do.	216	3	219
Polovina	July 31	4,089	72	4,161
Polovina Cliffs	do.	1,544	9	1,553
Little Polovina	do.	1,053	12	1,065
Morjovi	July 30	2,357	38	2,395
Vostochni	do. July 31	20,404	577	20,981
Total		86,530	1,607	88,137
ST. GEORGE ISLAND.				
North	Aug. 6	5,622	109	5,731
Staraya Artel	do.	4,397	53	4,450
Zapadni	Aug. 5	978	11	989
South	do.	26		26
Little East	Aug. 7			
East Reef	do.	1,044	3	1,047
East Cliffs	do.	3,119	28	3,147
Total		15,186	204	15,390
St. Paul Island		86,530	1,607	88,137
St. George Island		15,186	204	15,390
Total, both islands		101,716	1,811	103,527

PERCENTAGE OF INCREASE OR DECREASE IN THE NUMBER OF PUPS IN 1915 FROM 1914.

Rookery.	Total pups, 1914.	Total pups, 1915.	Percentage of increase (+) or decrease (−).
ST. PAUL ISLAND.			
Kitovi	2,119	2,475	+ 16.80
Lukanin	1,834	1,954	+ 6.54
Gorbatch	6,152	6,978	+ 13.43
Ardiguen	656	632	− 3.66
Reef	13,559	14,750	+ 8.78
Sivutch	4,052	4,535	+ 11.92
Lagoon	375	394	+ 5.07
Tolstoi	9,934	11,623	+ 17.00
Zapadni	7,625	8,740	+ 14.62
Little Zapadni	4,919	5,682	+ 15.51
Zapadni Reef	206	219	+ 6.31
Polovina	3,555	4,161	+ 17.04
Polovina Cliffs	1,449	1,553	+ 7.18
Little Polovina	927	1,065	+ 14.88
Morjovi	2,312	2,395	+ 3.59
Vostochni	19,709	20,981	+ 6.45
Total	79,383	88,137	+ 11.03
ST. GEORGE ISLAND.			
North	5,301	5,731	+ 8.11
Staraya Artel	4,278	4,450	+ 4.02
Zapadni	1,022	989	− 3.23
South	1	26	+2,500.00
Little East	26		− 100.00
East Reef	581	1,047	+ 80.20
East Cliffs	2,658	3,147	+ 18.40
Total	13,867	15,390	+ 10.98
St. Paul Island	79,383	88,137	+ 11.03
St. George Island	13,867	15,390	+ 10.98
Total, both islands	93,250	103,527	+ 11.02

The foregoing table is especially interesting when compared with the similar one for 1914.[a] In neither is there any apparent regularity in the increases and decreases. That the cows are governed by no absolute law in choosing their rookeries seems certain. One small rookery made a phenomenal growth of 80 per cent. Tolstoi, a large one, increased 17 per cent, while Vostochni, the largest rookery on the islands, increased only 6.45 per cent. These are conditions which can not be accounted for with the information at present available.

Mortality of pups.—The following table shows the percentages of dead pups found on the rookeries at the time of the count. Not over half a hundred had recently died. The majority had been dead long enough to be partly decomposed and gave evidence that trampling and crushing between bowlders had caused their death. The greatest mortality seems to occur at the height of the breeding season; that is, at the time the pups are being born. Only a small percentage seemed to have died a natural death.

NUMBER AND DISTRIBUTION OF DEAD PUPS IN 1915.

Rookery.	Total pups.	Dead pups.	Percentage of dead.	
			1915.	1914.
ST. PAUL ISLAND.				
Kitovi	2,475	46	1.86	2.2
Lukanin	1,954	28	1.43	3.9
Gorbatch	6,978	96	1.37	1.3
Ardiguen	632	9	1.42	1.6
Reef	14,750	244	1.65	1.5
Sivutch	4,535	56	1.23	1.6
Lagoon	394	7	1.78	.5
Tolstoi	11,623	122	1.05	1.7
Zapadni	8,740	192	2.19	1.6
Little Zapadni	5,682	96	1.69	1.5
Zapadni Reef	219	3	1.37	1.4
Polovina	4,161	72	1.73	1.9
Polovina Cliffs	1,553	9	.58	1.2
Little Polovina	1,065	12	1.13	1.8
Morjovi	2,396	38	1.58	1.8
Vostochni	20,981	577	2.75	2.5
Total	88,137	1,607	1.82	1.9
ST. GEORGE ISLAND.				
North	5,731	109	1.90	2.1
Staraya Artel	4,450	53	1.19	1.4
Zapadni	989	11	1.11	.7
South	26	......	......	......
East Reef	1,047	3	.28	.8
East Cliffs	3,147	28	.89	1.1
Total	15,390	204	1.32	1.5
St. Paul Island	88,137	1,607	1.82	1.9
St. George Island	15,390	204	1.32	1.5
Total, both islands	103,527	1,811	1.74	1.8

The percentages for 1915 when compared with these for 1914 show there was a slight decrease in the death rate. The 1914 percentages are inserted in the table to make comparisons easy. Only on Vostochni is there a constant high death rate. This is doubtless due, as the 1914 investigation has indicated, to the proximity of enormous hauling grounds. As Hutchinson Hill fills up with breeding seals this loss may decrease.

No starving pups were seen, and no evidences of *Uncinaria* ravages were apparent. A considerable number of pups with the mange were seen on all the rookeries. As some bulls, cows, and bachelors, had it also, it may be advisable to gather statistics in 1916 upon the approximate number afflicted. It did not seem to affect the pups adversely. A very few were entirely without hair or fur, but the affection in general was noted only as small round spots. Some of the older seals appeared to have been clipped irregularly all over the body.

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[a] Bureau of Fisheries document no. 820, p. 44.

The number of pups which met death as a direct result of the count is shown as follows:

LOCATION AND NUMBER OF PUPS WHICH DIED AS DIRECT RESULT OF COUNT IN 1915.

Rookery.	Number killed.	Cause.
Morjovi	1	Drowning.
Vostochni	1	Trampling by bull.
Polovina	5	Smothering.
Tolstoi	4	Do.
North	5	Do.
Zapadni (St. George)	1	Do.
Total	17	

On sunny days, when the pups are driven out in a long, thin line to be counted, they try to pile up, and if they are not quickly separated the lower ones of the pile are sure to be smothered. There is one certain way to prevent casualties when this piling up occurs, which is to go into the pile of pups and scatter them in every direction. One need have no fear of injury from their bites if he wears boots, and no injury will result to the pups by being trampled upon. In 1915 almost the entire count was made in hot, sunny weather, and it speaks well for the faithfulness and attention of the native attendants that so few pups were killed.

Breeding cows.—The female gives birth to her first young when three years of age. The evidence goes to show that the period of gestation is a few days short of a year, and the 3-year-old cows are the last of the class to arrive on the rookeries, with the exception of the nubiles. Although they were carefully looked for earlier, the first branded 3-year-old cows were noted on July 17, on Kitovi rookery. After this they were seen on practically all rookeries during the remainder of the season.

The arrival of the cows on the rookeries is not an occasion for a general battle among the bulls. Fights over cows occur after the young are born and the cows come in heat. Many of the cows are then injured in the shoulders and flanks by the bulls, and most of the mortality among the cows on land results from such injuries. The total number of deaths of cows on land at present, however, is so small as to be almost negligible. The total number of dead cows found in 1915 was 39.

After her arrival at the rookeries, if the cow does not give birth to her pup immediately, some time is spent swimming up and down in front of the rookery. She will then come out very cautiously, always endeavoring to escape to the water when a bull tries to intercept her. And once she is intercepted she spends considerable time trying to escape from one bull to another. Very seldom does a bull go into the water after a cow. As the water-line tier of bulls of a rookery intercepts the cows the rookery fills up by those escaping to the rear. This is exactly contrary to the manner in which the rookeries fill with bulls. They go around the ends of the water-line row of established bulls.

The number of pups born shows that there were 103,527 breeding cows in 1915. Excellent data regarding the unknown loss at sea during the first three years may be obtained from these figures. It is now pretty well established that the average breeding period of cows is about 10 years. Several branded 13-year-old cows with pups were seen in 1915. The loss to the breeding cows each year should therefore be 10 per cent of the number present the previous summer. Ninety per cent of the breeding cows of 1914 should therefore be represented in the figures 103,527. The remainder should represent the number of 3-year-old cows which came upon the rookeries in 1915. Ten per cent deducted from the 93,250 breeding cows in 1914 leaves 83,925 for 1915. This deducted from the number of breeding cows present in 1915 leaves 19,602 as the number of 3-year-old cows in 1915. That is, this is the number left of the 40,992 females born in 1912, assuming, of course, an equal birth rate. Very close to 50 per cent of those born have therefore survived. The best figures obtainable previous to this were gotten in the days of pelagic sealing and amounted to 61 per cent loss the first three years.

The natural mortality for each year of the first three can not be determined accurately. But in order to estimate the number of seals in each category, arbitrary percentages of loss must be assumed. After carefully considering the conditions involved these have been tentatively placed at 35 per cent loss the first year, 20 per cent of the remainder the second, and 4 per cent of the remainder the third, which aggregate 50 per cent loss during the first three years.

Harem bulls and idle bulls.—Harem bulls and younger bulls, some of the latter becoming idle bulls later in the season, are the first seals of the herd to appear at the islands in the spring. Forty came to Sea Lion Rock on April 14, 1915. For several days after their arrival the bulls slept at the water's edge, and not until May 2 did one get into position on Reef Rookery.

Not much fighting occurs until after a considerable number of cows have come into heat, and then it is more among the idle-bull class than among the harem masters. When an idle bull starts down through a rookery a great deal of commotion is caused and the bulls near by all start for him. Some bulls will leave their own harem and go through five or six others after a young bull on such occasions, yet this harem master is unmolested by the masters of the harems through which he passes. Battles to a finish are of common occurrence, as the evidence shows, but they are seldom witnessed. The injuries thus received sometimes cause death. A large number of young bulls were seen on the hauling grounds through the latter part of the breeding season so badly crippled they could scarcely travel.

In many ways the count of harems is the most important census work which can be done on the islands. But to be of greatest value, each rookery should be counted on exactly the same date from year to year. The dates established by the 1914 investigation well represent the height of the breeding season. In 1915 this count was made between July 17 and 21, each rookery being counted on the same date as in 1914 with the exception of Sea Lion Rock, which was one day later owing to inclement weather conditions. The charts of the rookeries published by the Coast and Geodetic Survey were taken in the field and the positions of the breeding masses and all outlying harems were plotted as nearly exact as was possible without instrumental aid. By locating the white numbered rocks and natural landmarks which are on these charts, the lines of breeding masses can be located with a margin of error of only a few feet. The ground which had been hauled over by bachelors was likewise plotted on the same charts during the harem counts.

On St. George Island the breeding and hauling areas were not plotted until the pup count, August 5 to 7. A. H. Proctor had recorded the number of harems between the white numbered rocks and other landmarks on July 19 and 20, and the breeding area does not change appreciably between the harem and pup counts. The margin of error of the areas as plotted for St. George is slightly greater than for St. Paul, but is believed to be sufficiently exact to be of considerable value in 1916 in showing rookery expansions.

The number of pups in each breeding mass was also recorded separately during the pup count and from these counts it is possible to determine the average harem for each mass. This shows the variation on each rookery perhaps better than any other method.

The numbered rocks are of very great value in making the harem count. In large breeding masses especially, it is impossible for the eye to grasp the entire mass without a mark or rest of some kind. It is necessary that some of these numbers which are dim or obliterated be repainted. And it is even more necessary that lines be extended from these numbers to the beach line in the large massed areas. White paint placed on the tops of the rocks in a line would be sufficient. On Reef Rookery, for instance, the numbered rocks are so far back from the beach line that the number of harems between two can not be determined. In a few places additional numbered rocks are needed. On the southwest end of Gorbatch the numbered rocks do not extend far enough.

In 1916 it will also be necessary to build some towers. The harems have spread over some of the only available observation points on Reef, Tolstoi, and Zapadni. Without some elevated position it is not possible to count the beach line harems and those that have extended out over the table-land. On some of the rookeries there is driftwood, which may be used to construct elevated stations. Artificial divisions of the rookeries are of great importance in making the harem count.

HAREM AND IDLE BULLS IN 1915.

Rookery.	Date.	Harem bulls.	Idle bulls.	Total.
ST PAUL ISLAND.				
Kitovi	July 17	67	24	91
Lukanin	...do....	46	18	64
Gorbatch	...do....	152	35	187
Ardiguen	...do....	25	6	31
Reef	...do....	294	59	353
Sivutch	July 21	96	23	119
Lagoon	July 18	15	4	19
Tolstoi	...do....	237	46	283
Zapadni	...do....	173	92	265
Little Zapadni	...do....	106	26	132
Zapadni Reef	...do....	7	6	13
Polovina	July 19	70	31	101
Polovina Cliffs	...do....	33	11	44
Little Polovina	...do....	21	9	30
Morjovi	...do....	51	21	72
Vostochni	...do....	396	135	531
Total		1,789	546	2,335
ST. GEORGE ISLAND.				
North	July 20	141	53	194
Staraya Artel	...do....	89	31	120
Zapadni	July 19	23	10	33
South	...do....	3	......	3
Little East	July 20	......	......	......
East Reef	...do....	30	18	48
East Cliffs	...do....	76	15	91
Total		362	127	489
St. Paul Island		1,789	546	2,335
St. George Island		362	127	489
Total, both islands		2,151	673	2,824

The percentages of gain were about what were expected from the 1914 investigation. Only one rookery as a whole lost; this was Little East on St. George, and it had only one harem to lose. When the details of the rookeries are considered and the counts of each section compared with the charts of 1914 there is seen to be a shrinkage in many of the scattered harem sections of several rookeries. This shrinkage is caused by the dying off of the old rookery bulls. It seems to be a law among the young bulls to flock to the massed areas, and consequently these made the greatest gains in harems. Only when a young bull is completely whipped does he go away by himself. Then he hauls out on the beach away from all harem bulls. Sometimes cows will come to him there and a new rookery section is started. By far more new areas were started in 1915 than showed a shrinkage. Rookery area once abandoned by the dying off of the old bulls stands no more chance of becoming occupied again than any other suitable isolated section of the beaches. A young bull is much more likely to start a new rookery than he is to repair to the vicinity of one or two old bulls to swell some scattered harem section.

The percentages of gains are shown in the following table:

PERCENTAGES OF GAIN OF BULLS OVER 1914.

Rookery.	Harem bulls.			Idle bulls.			Total.		
	1914	1915	Gain.	1914	1915	Gain.	1914	1915	Gain.
ST. PAUL ISLAND.									
Kitovi	58	67	15.52	5	24	380.00	63	91	44.44
Lukanin	39	46	17.95	1	18	1,700.00	40	64	60.00
Gorbatch	112	152	35.71	9	35	288.89	121	187	54.54
Ardiguen	15	25	66.67	0	6	....	15	31	106.67
Reef	193	294	52.33	26	59	126.92	219	353	61.19
Sivutch	91	96	5.49	10	23	130.00	101	119	17.82
Lagoon	8	15	87.50	2	4	100.00	10	19	90.00
Tolstoi	161	237	47.20	38	46	21.05	199	283	42.21
Zapadni	114	173	51.75	24	92	283.33	138	265	92.03
Little Zapadni	90	106	17.78	10	26	160.00	100	132	32.00
Zapadni Reef	3	7	133.33	1	6	500.00	4	13	225.00
Polovina	58	70	20.69	3	31	933.33	61	101	65.57
Polovina Cliffs	22	33	50.00	6	11	83.33	28	44	57.14
Little Polovina	18	21	16.67	0	9	....	18	30	66.67
Morjovi	43	51	18.60	4	21	425.00	47	72	53.19
Vostochni	291	396	36.08	20	135	575.00	311	531	70.74
Total	1,316	1,789	35.94	159	546	243.39	1,475	2,335	58.30
ST. GEORGE ISLAND.									
North	94	141	50.00	4	53	1,225.00	98	194	97.96
Staraya Artel	63	89	41.27	4	31	675.00	67	120	79.10
Zapadni	14	23	64.28	0	10	....	14	33	135.71
South	[a] 1	3	200.00	0	0	....	1	3	200.00
Little East	1	0	[b] 100.00	0	0	....	1	0	[b] 100.00
East Reef	14	30	114.28	3	18	500.00	17	48	182.35
East Cliffs	57	76	33.33	2	15	650.00	59	91	54.24
Total	244	362	48.36	13	127	876.92	257	489	90.27
St. Paul Island	1,316	1,789	35.94	159	546	243.39	1,475	2,335	58.30
St. George Island	244	362	48.36	13	127	876.92	257	489	90.27
Total, both islands	1,560	2,151	37.88	172	673	291.28	1,732	2,824	63.04

[a] South rookery had one harem in 1914. Bureau of Fisheries document no. 820, p. 172.
[b] Loss.

This table is one of the most interesting compiled from the 1915 figures. It shows the enormous percentages of increase of the idle-bull class over the percentage of increase of the harem-bull class on the same rookery. The fact that there was an excess of idle bulls and still the average harem is large seems to be the best evidence that the natural average harem is large. But that the natural average harem has not yet been reached is shown by the fact that, whereas harem bulls increased 37.88 per cent, breeding cows increased only 11.02 per cent. This discrepancy is partly offset by the fact that pelagic sealing was more destructive to the females than to the males. It seems that in a state of nature the percentage of increase of harem bulls should be only slightly greater than the increase of the breeding cows. The percentage of increase of the males over that of the females should, however, increase gradually, as the necessity of fighting shortens the life of the males.

The natural average harem—that is, the minimum average harem—will undoubtedly be almost reached in 1916, when there will be an enormous increase of the idle-bull class. Then with accurate counts of breeding bulls and cows it is believed that definite data as to increases and average harems may be obtained.

Average harem.—The average number of cows to each breeding bull will be one of the most important factors in determining the size of the fur-seal herd after it becomes too large for the pups to be accurately counted. A condition has probably never existed when every bull had the same number of cows or when the average harem on every rookery was the same. The fact that scattered harems are smaller than massed harems is the cause of this. In order to ascertain as nearly as possible the proper admixture of massed harems and scattered harems to give the average harem of the herd, the average harem was determined in 1915 for every breeding mass.

The following table shows the average harem for the several rookeries and for the herd as a whole:

THE AVERAGE HAREM SHOWN BY ROOKERIES.

Rookery.	1914.			1915.		
	Breeding cows.	Harem bulls.	Average harem.	Breeding cows.	Harem bulls.	Average harem.
ST. PAUL ISLAND.						
Kitovi	2,119	58	36.5	2,475	67	36.9
Lukanin	1,834	39	47.0	1,954	46	42.5
Gorbatch	6,152	112	54.9	6,978	152	45.9
Ardiguen	656	15	43.7	632	25	25.3
Reef	13,559	193	70.3	14,750	294	50.2
Sivutch	4,052	91	44.5	4,535	96	47.3
Lagoon	375	8	46.9	394	15	26.3
Tolstoi	9,934	161	61.7	11,623	237	49.0
Zapadni	7,625	114	66.9	8,740	173	50.5
Little Zapadni	4,919	90	54.7	5,682	106	53.6
Zapadni Reef	206	3	68.7	219	7	31.3
Polovina	3,555	58	61.3	4,161	70	59.4
Polovina Cliffs	1,449	22	65.9	1,553	33	47.1
Little Polovina	927	18	51.5	1,065	21	50.7
Morjovi	2,312	43	53.8	2,395	51	46.9
Vostochni	19,709	291	67.7	20,981	396	53.0
Total	79,383	1,316	60.3	88,137	1,789	49.27
ST. GEORGE ISLAND.						
North	5,301	94	56.4	5,731	141	40.6
Staraya Artel	4,278	63	67.9	4,450	89	50.0
Zapadni	1,022	14	73.0	989	23	43.0
South	1	1	1.0	26	3	8.7
Little East	26	1	26.0	....	....	....
East Reef	581	14	41.5	1,047	30	34.9
East Cliffs	2,658	57	46.6	3,147	76	41.4
Total	13,867	244	56.8	15,390	362	42.51
St. Paul Island	79,383	1,316	60.3	88,137	1,789	49.27
St. George Island	13,867	244	56.8	15,390	362	42.51
Total, both islands	93,250	1,560	59.8	103,527	2,151	48.13

The most conspicuous result shown by these figures is the decrease of the average harem from 59.8 in 1914 to 48.13 in 1915. From some standpoints this is a condition greatly to be desired. It is undoubtedly approaching the point of stability. Another year of counting should determine the number of idle bulls which are required to maintain the average harem at its minimum. After this percentage is once determined there need never be apprehension as to the sufficiency of male life as long as this number of idle bulls is present.

The following table shows the proportion of idle bulls to harem bulls in 1915. It is believed that this percentage of idle bulls has not yet brought about the minimum average harem; that is, the percentage of idle bulls to harem bulls should be somewhat greater than 31.28, the 1915 figure, in order to reduce the number of cows to each bull to the lowest possible number.

PERCENTAGES OF IDLE BULLS TO HAREM BULLS IN 1914 AND 1915.

Rookery.	Harem bulls, 1915.	Idle bulls, 1915.	Percentage idle bulls to harem bulls, 1915.	Percentage idle bulls to harem bulls, 1914.
ST. PAUL ISLAND.				
Kitovi	67	24	35.8	8.6
Lukanin	46	18	39.1	2.6
Gorbatch	152	35	23.0	8.0
Ardiguen	25	6	24.0	....
Reef	294	59	20.0	13.5
Sivutch	96	23	23.9	10.9
Lagoon	15	4	26.7	25.0
Tolstoi	237	46	19.4	23.6
Zapadni	173	92	53.2	21.0
Little Zapadni	106	26	24.5	11.1
Zapadni Reef	7	6	85.7	33.8
Polovina	70	31	44.3	5.1
Polovina Cliffs	33	11	33.3	27.2
Little Polovina	21	9	42.9	....
Morjovi	51	21	41.2	9.3
Vostochni	396	135	34.1	6.8
Total	1,789	546	30.52	12.0
ST. GEORGE ISLAND.				
North	141	53	37.6	4.2
Staraya Artel	89	31	34.8	6.3
Zapadni	23	10	43.5	....
South	3	....	....	....
Little East	....	....	....	....
East Reef	30	18	60.0	21.4
East Cliffs	76	15	19.7	3.5
Total	362	127	35.08	5.3
St. Paul Island	1,789	546	30.52	12.0
St. George Island	362	127	35.08	5.3
Total, both islands	2,151	673	31.28	11.0

In 1914 the percentage of idle bulls to harem bulls was 11, and the average harem was 59.8. In 1915 there is a large increase in the one and a decrease in the other. The percentage of idle bulls which is necessary to make the average harem the natural one (which is the minimum) is unknown. The large increase in bulls in 1916 will probably determine this. And once it is known, as stated before, there need never be apprehension as to the supply of males so long as the proportion of idle bulls to harems is near that figure. Harems and idle bulls may always be counted with a fair degree of accuracy, even should the herd become many times larger than it is at present. If the proportion of idle bulls is sufficient to keep the average harem at its minimum, the size of the herd may be very closely calculated from the count of those two categories. Undoubtedly the minimum average harem existed in 1896 and 1897 and would have remained at that point regardless of any excess number of idle bulls necessary to maintain this. But the proportion of idle bulls and the average harem were not determined with sufficient exactness to become a safe factor in formulating a law of increase.

The average harem should reach its minimum and then the number of idle bulls may increase indefinitely without lessening it. The percentage of killable seals should come out of those males in excess of the number necessary to maintain the minimum average harem. Present indications are that the minimum average harem will not be far from 40, and the percentage of idle bulls to harem bulls necessary to maintain this will be near 50. Even if the percentage of idle bulls to harems is as high as 100 there will still be available for killing over 90 per cent of those males which reach the age of 3 years. Because of the impossibility of obtaining as high as 90 per cent there would still be a large excess of idle bulls over those necessary to maintain the minimum average harem.

Yearlings.—The yearling seals spend a very short time on land. For this reason they were unknown as a type for a great many years. They are the last of the herd to reach the islands on the northern migration. Very few reach St. George Island before July 20 and almost none reach St. Paul Island before August 1. They become abundant on St. George by August 10 and on St. Paul by August 20. The evidence is almost conclusive that this is the only category of the seals which does not arrive at both islands almost simultaneously.

On September 10, 1915, the entire stretch of Zoltoi Sands, St. Paul Island, was occupied by yearlings and pups, the first time for a great many years. The yearlings are not so heavy as the largest pups at that season, but are much more agile and lithe. The fact that the flippers outgrow the rest of the body is one of the most characteristic features of the yearlings. Before leaving the islands in November and December a large number of the pups exceed them in weight. Some are heavier by 20 pounds. Once recognized, the yearlings are rarely confused with the larger 2-year-olds.

The number of yearlings in the herd must necessarily be computed from the number of births the previous year. The percentage to be deducted for loss at sea is carefully considered on page 83. For the first year 35 per cent is the best figure at present available. That 50 per cent, the figure previously used, is too high is shown by the 3-year-old cows coming on the rookeries in 1915 in greater numbers than should have been in existence had this estimated percentage of loss been an actual fact. The figures of 1915 show that the total loss through the first three years is only 50 per cent. It may not be so great as this, but appears large in 1915 because of the lagging influences of pelagic sealing. The division of the 50 per cent loss for the first three years between the classes is arbitrary and must necessarily remain so. It is here considered as 35 per cent loss the first year, 20 per cent the second, and 4 per cent the third year. The high percentage of loss the second year is warranted by the fact that when the yearlings leave the islands in the fall they are relatively in poor condition. The pups on the other hand are rolling fat and likewise many of the 2-year-olds. In variance to commonly accepted opinion, the period of greatest hardship for the young seal does not appear to be over until it is well into the second winter. Many of the yearlings seen in 1913, 1914, and 1915 were very poor. They probably have almost as hard a time to live as the pups do.

Applying the loss of 35 per cent for the first year to the total births of 1914 there remain a total of 60,613 male and female yearlings. Half of these should be of each sex.

Two-year-olds.—The 2-year-old seal is a well-known type. The males come to the islands as a class a few days later than the older seals, usually after the middle of June. It is a well-recognized fact on the islands that the earliest drives are almost devoid of "little seals," and contain a large number of young bulls. The 2-year-old seals were long thought to be yearlings and are still considered such by many of the natives. But their inability to distinguish between the different classes of seals was well shown in 1915. The most intelligent of the natives declared that some of the branded 3-year-old males killed were 2-year-olds because they were smaller than what they had become accustomed to regard as the 3-year-old type. They did this in spite of the fact that they themselves put the brands on those identical seals when they were pups in 1912.

The 2-year-old males arrive at the islands some two weeks earlier than the females. The latter return to land for their first impregnation after most of the pups are born.

No known 2-year-olds were killed on St. Paul in 1915. That is, no seals were killed which were less in body length than the smallest known 3-year-old which was killed. Consequently no deductions are made from the 2-year-old class for any killed in 1915. Skin weights are so absolutely fallacious as a criterion in determining the class to which the animals belong that they can not even be considered. Thirty-one per cent of the 100 known 3-year-old males killed in 1915 had skins weighing 5¼ pounds or less. This weight has been the division point of the 2-year-old and 3-year-old classes. Any computations based upon a premise involving such a margin of error should not be seriously considered. The skin of any seal weighs according to the fleshiness of the animal, the sharpness of the skinner's knife, the time of day, the condition of the weather, and the personality of the Aleut who takes it off. The skin of a small seal may therefore be heavy and a large one may be light.

The total births in 1913 were 92,269. Deduct 35 per cent for loss the first year and there remained 59,975 yearlings in 1914. Deduct 20 per cent for loss the second year and there remain 47,980 2-year-olds of both sexes in 1915. Half of these should be males and half females, or 23,990 of each sex.

Three-year-old males.—This is the class from which skins are taken at present. It was formerly thought that the individuals of this class were uniform in size and skin weights, but the figures obtained in 1915 show conclusively that there is a great amount of variation. Only 16 seals are known to have been killed from this class in 1914, the branded 2-year-olds. Consequently these only can be deducted.

The number of the class at the close of the killing season, August 10, 1915, is shown as follows: Deduct from 81,984, the number of pups born in 1912, 35 per cent for loss the first year and there remained 53,290 yearlings in 1913. Of these, half should be females, leaving 26,645 males. Five of these were killed in 1913, which leaves 26,640. Deduct 20 per cent from this for loss the second year and there are 21,312 2-year-old males at the beginning of the 1914 season. Sixteen of these were known to have been killed, leaving 21,296 at the close of the 1914 season.

Of the 21,296 2-year-old males at the close of the 1914 season, 4 per cent should have been the loss at sea. This leaves 20,444 3-year-old males at the beginning of the 1915 season; 1,168 of these were killed on St. Paul Island and 994 on St. George Island prior to August 10, leaving 18,282 as the number which still exist.

Of the 26,645 yearling females in 1913, 20 per cent should have been lost the second year, leaving 21,316 2-year-olds to be impregnated in 1914. Allowing 4 per cent loss the third year leaves 20,463 females which should have gone into the breeding cow class in 1915. The number which actually gave birth to pups in 1915 is found by deducting 10 per cent from the 93,250 breeding cows of 1914 for loss due to old age, and subtracting the remainder, 83,925, from the known number of breeding cows in 1915, 103,527, leaves 19,602, which is so close to the 20,463 that the difference is negligible.

Four-year-old males.—Many of the smaller ones of this class intergrade in size with the larger 3-year-olds. Since the animals were born in 1911 they have not been subjected to pelagic sealing and the losses of 35, 20, and 4 per cent should be applied to them. The loss at sea after the third year and up to the twelfth seems to be so small that it is negligible.

The births in 1911 as determined by the 1914 investigation[a] were 75,000. After deducting 35 per cent loss for the first year and 20 per cent for the second year, there remained 39,000 2-year-olds in 1913. Half of these should have been males and half females. The latter have gone into the breeding-cow class and of the 19,500 males, 4 per cent should have been the loss the third year, leaving 18,720 3-year-olds at the beginning of the 1914 season. Of these 1,901 were killed on St. Paul Island and 971 on St. George Island, leaving 15,848 as the number of 4-year-old males in the herd in 1915. It is safe to assume that only a negligible number of them were killed as 2-year-olds in 1913 and as 4-year-olds in 1915. It is not possible to get a close approximation to the exact number from the published skin weights. The 1914 investigation assumed a maximum skin weight of 5¼ pounds for 2-year-olds and the same for a minimum for the 3-year-olds and on this basis deducted 515 from this class as having been killed in 1913 as 2-year-olds. Data obtained in 1915 show that such a division can not be made, therefore the 515 supposed to have been killed as 2-year-olds in 1913 are restored to the 3-year-old class of that year.

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[a] Bureau of Fisheries document no. 820, p. 35.

Five-year-old males.—This class was subjected to pelagic sealing in 1911. Therefore the losses of 50 and 15 per cent applied to it for the first two years in the 1914 census may be allowed to stand.

The 1914 investigation deducted 541 from this class supposed to have been killed as 2-year-olds in 1912. The basis of the calculation was the skin weight which is now known to express no age relation. As the number of males killed from the present 6-year-old class does not enter into the computation of the number of that class it is not necessary to do anything further than restore the number to the present 5-year-old class. But it is necessary to deduct from this year's 5-year-old class 515 seals killed in 1913. Therefore, taking the figures of the 1914 investigation down to 1912 we have at the close of that year 13,954 2-year-old males. Since no pelagic sealing was done, only 4 per cent should be deducted for mortality the third year. This leaves 13,396 3-year-olds at the beginning of the 1913 season; 2,125 were killed, leaving 11,271 at the close of that year. As the loss at sea the two succeeding winters is unknown and can not be large, no deductions are made. Therefore the latter may be taken as representing the number of 5-year-old males in the herd of 1915. Other evidence goes to show that the actual number is, if anything, greater than this figure.

Bachelor and half-bull counts.—A simultaneous count of hauling-ground seals on all the rookeries could not be made in 1915 as in 1914 because of the shortage of assistance. The seals on the hauling grounds were counted, however, at the time of the height-of-season harem counts. The fact that these extended over a period of five days on St. Paul Island and two days on St. George does not alter the result appreciably, because the number of seals on any hauling ground at that season is a comparatively constant figure.

During the days of commercial killing it was believed that about one-fifth of these classes were on land at one time. The results obtained by using this proportion as a basis for determining the number of 2, 3, 4, and 5 year old males present fully sustain the results secured when computing these classes by the method of applying the percentages of loss used in 1915 to the numbers born.

COMPLETE CENSUS OF FUR SEALS IN 1915.

Pups, as per count, July 27 to Aug. 7		103,527
Breeding cows, 3 years of age and over		103,527
Bulls, in active charge of harems as per counts, July 17–21		2,151
Idle bulls, in position for harem service but without cows, as per counts, July 17–21		673
Yearlings, male and female:		
Pups born in 1914	93,250	
Deduction of 35 per cent for natural mortality in first year	32,637	
Yearlings in 1915		60,613
2-year-olds, male and female:		
Pups born in 1913	92,269	
Deduction of 35 per cent for natural mortality in first year	32,294	
Yearlings, both sexes, in 1914	59,975	
Deduction of 20 per cent for natural mortality in second year	11,995	
2-year-olds, both sexes, in 1915		47,980
3-year-old males:		
Pups born in 1912	81,984	
Deduction of 35 per cent for natural mortality in first year	28,694	
Yearlings, both sexes, in 1913	53,290	

3-year-old males—Continued.		
Deduction of 50 per cent for females	26,645	
Yearling males in 1913	26,645	
Deduction of known yearlings killed in 1913	5	
Yearling males at close of 1913	26,640	
Deduction of 20 per cent for natural mortality in second year	5,328	
2-year-olds at beginning of 1914	21,312	
Deduction of known 2-year-olds killed in 1914	16	
2-year-old males at end of 1914	21,296	
Deduction of 4 per cent for natural mortality in third year	852	
3-year-olds at beginning of 1915	20,444	
Deduction of 3-year-olds killed in 1915	2,162	
3-year-old males at end of 1915 killing season		18,282
4-year-old males:		
Pups born in 1911, as per estimate of Osgood, Preble, and Parker[a]	75,000	
Deduction of 35 per cent for mortality in first year	26,250	
Yearlings, male and female, in 1912	48,750	
Deduction of 20 per cent for mortality in second year	9,750	
2-year-olds, both sexes, in 1913	39,000	
Deduction of 50 per cent for females	19,500	
2-year-old males at beginning of 1913	19,500	
Deduction of 4 per cent for mortality in third year	780	
3-year-old males at beginning of 1914	18,720	
3-year-olds killed in 1914	2,872	
3-year-old males at close of 1914, and 4-year-old males in 1915		15,848
5-year-old males:		
2-year-old males at close of 1912	13,954	
Deduction of 4 per cent for mortality in third year	558	
3-year-old males at beginning of 1913	13,396	
3-year-olds killed in 1913	2,125	
3-year-olds at close of 1913	11,271	
No deductions for mortality in fourth and fifth years.		
5-year-old males in 1915		11,271
Recapitulation:		
Pups	103,527	
Breeding cows	103,527	
Harem bulls	2,151	
Idle bulls	673	
Yearlings	60,613	
2-year-olds	47,980	
3-year-old males	18,282	
4-year-old males	15,848	
5-year-old males	11,271	
Total, all classes		363,872

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[a] Bureau of Fisheries document no. 820, p. 35.

BRANDED SEALS.

The branding of several thousand fur-seal pups at the Pribilof Islands in 1912 has been productive of knowledge not before obtainable. In the winter of 1915–16 the data which had been obtained were assembled as far as practicable and some of the more important facts are deemed worthy of publication.

The work of branding the pups in 1912 was undertaken by George A. Clark, acting under instructions from the Bureau. Mr. Clark being unable to complete the work, it was continued by W. I. Lembkey on St. Paul Island, and by A. H. Proctor on St. George Island.

The following table gives certain details in regard to pups branded in 1912:

SUMMARY OF PUPS BRANDED IN 1912.

Date.	Island and rookery.	Males.	Females.	Sex not recorded.	Total.
	ST. PAUL ISLAND.				
1912.					
Aug. 29	Lukanin	28	18		46
Sept. 3	Gorbatch	311	254		565
Sept. 7	Reef	407	328		735
Sept. 8	do	202	172		374
Do	Kitovi	10	9		19
Oct. 29 and 30	Kitovi and Lukanin			1,005	1,005
Do	Reef			483	483
Total		958	781	1,488	3,227
	ST. GEORGE ISLAND.				
Sept. 16	North	475	455		930
Sept. 17	Staraya Artel	350	360		710
Oct. 9	North	102	139		241
Oct. 16	do	59	61		120
Total		986	1,015		2,001
Total, both islands.		1,944	1,796	1,488	5,228

The work of branding pups, as carried on by Mr. Clark on St. Paul Island, was described by him as follows:

> The process of branding is simple. The older natives hold the small group of pups after it has been surrounded in a loose fashion, merely to prevent the animals getting away. A dozen young men in two groups catch the pups, carrying them by the hind flippers, holding their heads flat on the ground by a grip on the skin of the neck at each side while the brand is being burnt in and then carrying them out of reach. The mark consists of a T, the stem reaching down between the eyes, the crosspiece between the ears. A space of half an inch or more is left free between the two burns. The red-hot iron burns through the fur readily, leaving a clear surface, a slight additional pressure insuring the destruction of the roots of the fur. Five seconds are sufficient for each of the two marks and both can be made with a single iron. A plumber's gasoline forge will keep three irons in condition and one operator could theoretically brand three animals a minute. In practice about one a minute is quick work. There is always delay in getting the pups ready. Moreover, the work is heavy, not merely for the persons doing the branding but for the native holding the animal. The 489 pups branded this afternoon represent a maximum half day's work for two men, or approximately 1,000 pups a day.

A number of the branded seals were observed in 1913. In 1914 they were observed in large numbers. In 1915 they appeared in such numbers as to indicate a lower mortality in the first three years of the fur seal's life than has been ordinarily assumed.

In 1913, 3 of the branded seals were killed on St. George Island. In 1914, 17 were killed on St. Paul Island and 1 on St. George Island. In 1915, through August 10, 53 were killed on St. Paul Island and 49 on St. George Island.

With the exception of the one 2-year-old taken on St. George Island in 1914 and one 3-year-old, an albino, taken on the same island in 1915, all the skins taken from branded seals killed in 1914 and in 1915 through August 10 were shipped to St. Louis. The 1914 St. George skin is still on that island, and the albino skin was sent to Washington.

In December, 1915, H. C. Fassett and G. Dallas Hanna were sent to St. Louis to obtain certain data in regard to these skins. Upon their arrival in St. Louis it was found that a cask containing 40 of the branded skins taken in 1915 on St. Paul Island had already been partly processed for the purpose of dyeing them and that certain data could not therefore be obtained. Fortunately, however, the skins had been graded as small pups, middling pups, etc., in accordance with the regular trade classifications, and this grading is of special value in view of the fact that it was done without any knowledge of its desirability or importance and was therefore carried on in an entirely perfunctory manner and on an exceptionally unbiased basis.

The following table shows in concise form certain data secured at the Pribilof Islands and at St. Louis in regard to this subject

DATA ON CERTAIN MALE SEALS KILLED, 1913 TO 1915, BRANDED AS PUPS IN 1912.[a]

YEARLINGS.

Serial No. of skins.	Date of killing.	Island.	Live weight.	Body length.	Green-skin weight.		Salt-skin weight.[a]		Effect of salt.		Salt-skin length.[a]	Salt-skin width.[a]	Trade classification, 1915-16.[a]
									Gain.	Loss.			
			Pounds.	Inches.	Pounds.	Ounces.	Pounds.	Ounces.	Ounces.	Ounces.	Inches.	Inches.	
696 (1)[a]......	Aug. 16, 1913	St. George......	39.25	37	4	6	......	......	......	......	......	......	
697 (2)[a]......	....do......	....do......	37.50	35.37	3	13	......	......	......	......	......	......	
3[a]......	Nov. 5, 1913	....do......	41.75	36	5	11	......	......	......	......	......	......	

TWO-YEAR-OLDS.

Serial No. of skins.	Date of killing.	Island.	Live weight.	Body length.	Green-skin weight.		Salt-skin weight.[a]		Effect of salt.		Salt-skin length.[a]	Salt-skin width.[a]	Trade classification, 1915-16.[a]
									Gain.	Loss.			
			Pounds.	Inches.	Pounds.	Ounces.	Pounds.	Ounces.	Ounces.	Ounces.	Inches.	Inches.	
(a)	July 9, 1914	St. George......	57.75	42	5	7	......	......	......	......	......	......	
P 5580......	July 1, 1914	St. Paul......	......	39.50	......	......	3	9.75	......	......	31	19.75	Extra small pup.
P 5583......	....do......	....do......	......	38.50	......	......	4	13.75	......	......	33.75	20.50	Small pup.
P 5584......	....do......	....do......	......	41	......	......	4	.50	......	......	33	19.75	Extra small pup.
P 5591......	....do......	....do......	......	36.75	......	......	4	3.80	......	......	35	20.25	Small pup.
P 5801......	July 21, 1914	....do......	......	42	5	6.75	5	1.35	......	5.50	32	20.25	Do.
P 5805......	....do......	....do......	......	41.75	4	9.75	4	5.75	......	4	31	21.50	Do.
P 5809[a]......	....do......	....do......	......	42.75	5	8	......	......	......	......	......	......	
P 5810......	....do......	....do......	......	41.25	5	9.75	5	6.50	......	3.25	32.50	19.75	Small pup.
P 5912[a]......	Aug. 1, 1914	....do......	......	38.25	3	14	3	12.75	......	1.25	30.75	19	Extra small pup.
P 5913......	....do......	....do......	......	41.50	4	13	4	10.50	......	2.50	30	21	Small pup.
P 6640......	Aug. 18, 1914	....do......	......	38.25	4	8	4	4	......	4	31	20.50	Do.
P 6641[a]......	....do......	....do......	......	41	5	12	......	......	......	......	......	......	
P 6642......	....do......	....do......	......	41	4	11.75	4	7	......	4.75	32.75	21	Small pup.
P 7090......	Nov. 17, 1914	....do......	......	41.50	5	......	4	14.50	......	1.50	36.50	23	Middling pup.
P 7091[a]......	....do......	....do......	......	41.30	4	13.25	4	9	......	4.25	36	23.50	Do.
P 7092......	....do......	....do......	......	45.25	5	7	5	2.75	......	4.25	36.75	23.75	Do.
P 7094......	Nov. 18, 1914	....do......	......	43.30	5	12.25	5	7.85	......	4.40	34.75	24.75	Do.

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[a] The salt-skin weight, salt-skin length, salt-skin width, and trade classification were obtained in St. Louis, Dec. 31, 1915, to Jan. 6, 1916. Skins bearing tags P 5809, P 6641, and G 2202 could not be located in the time at the disposal of the Bureau's agents at St. Louis. Skin bearing tag G 3041, taken from an albino seal, was at Washington. The skins taken from the yearling seals and that from the St. George 2-year-old seal had not been shipped from St. George Island. Skins bearing tags P 5912 and P 7091 were taken from females accidentally killed.

DATA ON CERTAIN MALE SEALS KILLED, 1913 TO 1915, BRANDED AS PUPS IN 1912.[a]—Continued.

THREE-YEAR-OLDS.

Serial No. of skins.	Date of killing.	Island.	Live weight.	Body length.	Green-skin weight.		Salt-skin weight.[a]		Effect of salt.		Salt-skin length.[a]	Salt-skin width.[a]	Trade classification, 1915-16.[a]
									Gain.	Loss.			
			Pounds.	Inches.	Pounds.	Ounces.	Pounds.	Ounces.	Ounces.	Ounces.	Inches.	Inches.	
P 7511	June 10, 1915	St. Paul	63	45.50	5	15							
P 7512	do	do	53.50	41.50	4	7.50							
P 7514	do	do	67.50	45.50	5	8							
P 7516	do	do	73.50	45.50	6	8.75							
P 7518	do	do	60	43.75	5	8							
P 7523	do	do	50.50	40.25	4	8							
P 7582	July 2, 1915	do	60.75	42.75	4	9							
P 7583	do	do	72.25	43.50	4	6.50							
P 7585	do	do	66.25	41.50	5	2							
P 7586	do	do	48.25	38.25	4	4.50							
P 7587	do	do	62.25	41.50	4	11							
P 7589	do	do	58.25	41.25	4	14							
P 7590	do	do	61.25	40.75	4	1.50							
P 7591	do	do	73	42.50	5	....							
P 7592	do	do	61.25	42	4	6.50							
P 7611	July 14, 1915	do	56	40	5	12							
P 7624	do	do	63	43.25	6	1.50							
P 7625	do	do	64	41.75	6	2							
P 7654	do	do	77	47.25	7	1.75							
P 7656	do	do	54	43	6	4.50							
P 7729	July 24, 1915	do	72	46.50	6	....	....	....	....	....	....	....	Classified Dec. 15, 1915, as follows: Small pups .... 4 Middling pups .... 13 Large pups .... 18 Small seals 5 40
P 7730	do	do	81.50	47.25	6	9.50							
P 7731	do	do	55	40	4	7.50							
P 7732	do	do	78	42	5	11.25							
P 7733	do	do	72.50	41.50	6	....							
P 7734	do	do	79.50	45.25	7	6.75							
P 7735	do	do	55.50	38.50	5	4.25							
P 7840	July 29, 1915	do	67.25	41.50	5	7							
P 7841	do	do	80.25	45.75	7	9							
P 7842	do	do	81.25	43	7	4.25							
P 7843	do	do	82.25	47.75	6	3.50							
P 7844	do	do	54.50	40.50	5	1.75							
P 7845	do	do	76.50	49.75	7	1							
P 7846	do	do	69.50	41.50	5	6							
P 7847	do	do	58.25	43	5	.75							
P 8154	July 30, 1915	do	68	45.75	6	6							
P 8155	do	do	75	42.75	5	10.25							
P 8156	do	do	78	44.50	5	12.75							
P 8157	do	do	63	44.50	6	12.75							
P 7655	July 14, 1915	do	68	46.50	5	4.50							

P 7321	June 1, 1915	do	61	42	5		4	15.50		150	34.75	26	Large pup.
P 7322	do	do	78	51.75	5	12	5	15.90	3.90		37.75	26.25	Do.
P 7512	June 10, 1915	do	55	45	5	8.50	5	8.12		.38	38	25.75	Do.
P 7515	do	do	73	49.50	5	11	5	11.75	.75		41	27.75	Small seal.
P 7517	do	do	54.50	44.75	4	9	4	6		3	37	26	Large pup.
P 7519	do	do	86.50	50.50	7	3	6	15.50		3.50	42.75	29.50	Middling and small.
P 7520	do	do	56	42	5	3.25	5	3.50	.25		37.75	25.50	Large pup.
P 7521	do	do	58.50	41.75	6	.25	5	13		3.25	37.25	27	Do.
P 7522	do	do	62.50	42.25	4	7.50	4	5		2.50	36.50	22.25	Middling pup.
P 7581	July 2, 1915	do	61.50	41.50	4	12.50	4	13	.50		34.75	24	Do.
P 7584	do	do	75	46.25	5	8	5	8.75	.75		37.50	27.50	Small seal.
P 7588	do	do	79	43	5	9	5	14	5		35.50	26.50	Large pup.
P 8324	Aug. 5, 1915	do	67	45.25	6	3.50	5	10		9.50	35	26.50	Middling pup.
G 2144	June 17, 1915	St. George	69	45.25	7	4	7	2.75		3.25	34.25	26.50	Do.
G 2145	do	do	83	47.75	7	3	6	13.25		5.75	33.75	26.75	Do.
G 2153	do	do	53.50	42	6	8	6	7.75		.25	32	24.50	Do.
G 2156	do	do	65	44.25	6	14	7	1	3		33	26.50	Do.
G 2169	June 24, 1915	do	65	40.75	6	8	6	13	5		32.50	25	Do.
G 2172	do	do	64	48.25	7	4	7			4	37.75	26.50	Large pup.
G 2174	do	do	65	45	7	4	6	14		6	37.75	26.50	Do.
G 2178	do	do	58.50	41.50	5	12	5	12			33	23	Middling pup.
G 2179	do	do	59.75	43.50	6	8	6	7.25		.75	33.25	27	Large pup.
G 2192	do	do	66.50	44.25	6	12	6	13.25	1.25		33.75	23.50	Middling pup.
G 2200	July 1, 1915	do	78	44.75	9	2	8	12.75		5.25	37.25	27.50	Large pup.
G 2201	do	do	55.50	41	6	8	6	8.50	.50		34.75	23.75	Middling pup.
G 2202 [a]	do	do	52	40.75	5	9							
G 2203	do	do	67.50	43.50	6	10	6	14.60	4.60		36.25	25.25	Large pup.
G 2204	do	do	70	43	7	9	7	10.75	1.75		35.50	27.75	Do.
G 2214	do	do	47	38	5	10	5	10.75	.75		32.25	24.25	Middling pup.
G 2423	July 7, 1915	do	56.50	41.50	6		5	11.50		4.50	31.50	26	Do.
G 2424	do	do	54.75	41.25	6	8	6	3.25		4.75	33.50	25	Do.
G 2530	July 9, 1915	do	56	42.25	6	6	6	10	4		33.75	23.75	Do.
G 2531	do	do	67.50	43	7	8	7	5.50		2.50	36.50	27	Large pup.
G 2532	do	do	52.50	39.75	6	8	5	15.25		8.75	34	24.25	Middling pup.
G 2533	do	do	62.50	42	6	8	6	7.53		.47	33.50	25.25	Do.
G 2534	do	do	69	45	7	12	7	8.25		3.75	34.50	24.25	Do.
G 2535	do	do	68.50	44.50	7	13	8	1.25	4.25		35	26.50	Large pup.
G 2536	do	do	60	42.25	5	8	5	14.50	6.50		32.75	24	Middling pup.
G 2608	July 16, 1915	do	61	41	7	4	6	14.75		5.25	36.75	27	Large pup.
G 2609	do	do	60	40.50	5	12	5	8.50		3.50	33.25	25	Middling pup.
G 2610	do	do	58	42	7	8	7	11	3		36.25	27.75	Large pup.
G 2611	do	do	64	43.50	7	4	7	.25		3.75	37.25	26.25	Do.
G 2612	do	do	66	43.25	6	12	6	9		3	33.75	25.75	Middling pup.
G 2613	do	do	77.50	44.50	8	12	8	13.75	1.75		38.25	27.50	Small seal.
G 2789	July 17, 1915	do	74	44.75	8	9	8	8		1	33.75	28	Large pup.
G 2816	July 22, 1915	do	61.50	45.50	6	4	6	12.25	8.25		33	27	Middling pup.
G 2847	do	do	57.50	42.50	6	8	6	9.50	1.50		34	28	Large pup.
G 2848	do	do	59	41.50	7	2	7	7.50	5.50		34.75	26	Middling pup.

[a] The salt-skin weight, salt-skin length, salt-skin width, and trade classification were obtained in St. Louis, Dec. 31, 1915, to Jan. 6, 1916. Skins bearing tags P 5809, P 6641, and G 2202 could not be located in the time at the disposal of the Bureau's agents at St. Louis. Skin bearing tag G 3041, taken from an albino seal, was at Washington. The skins taken from the yearling seals and that from the St. George 2-year-old seal had not been shipped from St. George Island. Skins bearing tags P 5912 and P 7091 were taken from females accidently killed.

DATA ON CERTAIN MALE SEALS KILLED, 1913 TO 1915, BRANDED AS PUPS IN 1912.[a]—Continued.

THREE-YEAR-OLDS—Continued.

Serial No. of skins.	Date of killing.	Island.	Live weight.	Body length.	Green-skin weight.		Salt-skin weight.[a]		Effect of salt.		Salt-skin length.[a]	Salt-skin width.[a]	Trade classification, 1915-16.[a]
									Gain.	Loss.			
			Pounds.	*Inches.*	*Pounds.*	*Ounces.*	*Pounds.*	*Ounces.*	*Ounces.*	*Ounces.*	*Inches.*	*Inches.*	
G 2849	July 22, 1915	St. George	69	42.25	7	8	7	5.50	....	2.50	34	25.50	Middling pup.
G 2850	do	do	61.50	45	7	4	7	6.50	2.50	....	34.75	27.75	Large pup.
G 2973	July 23, 1915	do	44	37.25	5	10	5	13	3	....	32	22	Small pup.
G 3041[a]	Aug. 2, 1915	do	69	46.50	....	....	....	....	....	....	....	....	
G 3108	Aug. 10, 1915	do	66	43	6	4	6	5.25	1.25	....	30.50	23	Do.
G 3109	do	do	57	42	7	12	7	3.75	....	8.25	35	25.50	Middling pup.
G 3110	do	do	71.50	42.75	8	13	8	4.50	....	8.50	36	28	Large pup.
G 3111	do	do	69	43.75	7	6	7	7.50	1.50	....	34.50	26	Do.
G 3112	do	do	73.50	44.75	8	....	7	10.50	....	5.50	36.25	26.75	Do.
G 3113	do	do	78	49.50	9	2	8	12.50	....	5.50	32.25	25.75	Middling pup.
G 3114	do	do	63	41.50	7	8	7	6.75	....	1.25	30.75	26	Small pup.
G 3115	do	do	65.50	44.75	8	8	8	5.75	....	2.25	33.25	25	Middling pup.
G 3116	do	do	59	42.50	8	4	7	14.75	....	5.25	34	24.75	Do.
G 3117	do	do	75	45.50	8	6	7	15.25	....	6.75	35	25	Do.

[a] The salt-skin weight, salt-skin length, salt-skin width, and trade classification were obtained in St. Louis, Dec. 31, 1915, to Jan. 6, 1916. Skins bearing tags P 5809, P 6641, and G 2202 could not be located in the time at the disposal of the Bureau's agents at St. Louis. Skin bearing tag G 3041, taken from an albino seal, was at Washington. The skins taken from the yearling seals and that from the St. George 2-year-old seal had not been shipped from St. George Island. Skins bearing tags P 5012 and P 7091 were taken from females accidently killed.

William G. Gibbins, who classified the branded skins, has been connected with the fur trade since 1873. For eight years he was with C. W. Martin, of the Alaska Factory, in London, and was trained as an unhairer of fur-seal pelts under the instruction of George Rice, a notable expert in that work. In 1882 he went with Mr. Rice as manager of his skin-dressing plant known as the Hudson Bay Works, Stratford, London, where he remained until September, 1915. All fur-seal skins that came into the factory in direct shipment were graded by Mr. Gibbins and their quality reported upon. For many years he was called in as an expert to grade all the sealskins which were sold by Messrs. C. M. Lampson & Co., the well-known fur auctioneers of London, and the catalogues were marked according to his judgment.

It will be noted from the table that the classification of 100 branded skins of 3-year-old seals was as follows:

Small pups	7
Middling pups	42
Large pups	42
Smalls	8
Middlings and smalls	1
Total	100

Also that 15 branded skins of 2-year-old seals graded as follows:

Extra small pups	3
Small pups	8
Middling pups	4

FOXES.

The herds of blue foxes which inhabit St. Paul and St. George Islands constitute a source of considerable revenue to the Government. The supply of suitable food available under natural conditions is only sufficient to support herds of comparatively small numbers. Were an abundant supply of seal meat available for food and suitable facilities for its preservation afforded, the size of the fox herds could be increased to numbers limited only by the facilities and help available for distributing food or by other factors not now foreseen. At present the refuse seal meat contributes some of the food supply to the foxes on both islands. In addition salt or dried fish or whale meat is used on St. George Island, where feeding operations to maintain the existing herd are more essential than on St. Paul Island. The topography of St. Paul Island, affording as it does longer stretches of beaches accessible to the foxes, enables the animals to secure greater quantities of food from the sea.

The trapping of foxes for their pelts in the season of 1915–16 was begun in November on St. George Island and early in December on St. Paul Island. The work on St. George Island was discontinued on December 29, but on St. Paul Island trapping operations were continued, with one intermission of about two weeks, December 13–25, until January 6. The take for the season was reported as follows: Blue-fox skins, St. Paul Island, 211; St. George Island, 209; total, 420; white-fox skins, St. Paul Island, 17; St. George Island, 2; total, 19. In addition, 1 white-fox skin was taken on St. Paul Island in February, 1916, which may properly be included with the season's take.

TAKE OF FOX PELTS, ST. PAUL ISLAND, SEASON OF 1915–16.

Districts.	Blue.		White.		Total.		Grand total.
	Male.	Female.	Male.	Female.	Male.	Female.	
Vicinity of village	30	34	1		31	34	65
Halfway Point	4	2	1		5	2	7
Northeast Point	34	27	[a] 8	1	37	28	65
North Shore	8	4	1	2	9	6	15
Northwest Point	5	4	1		6	4	10
Southwest Point	9	8	2	2	11	10	21
Southwest Bay	19	23	2	2	21	25	46
Total, all districts	109	102	11	7	120	109	229
Total, both sexes	211		18		229		

[a] Includes 1 pelt taken from dead fox found in sand dunes near Northeast Point, Feb. 21, 1916.

REINDEER.

The reindeer herds showed some increase in numbers, especially on St. Paul Island. A census of the two herds taken in the latter part of 1915 gave results as follows: St. Paul Island, 27 fawns and 65 aged 1 year and upward; St. George Island, 18 fawns and 44 aged 1 year and upward.

RADIO SERVICE.

The Navy Department kept in operation throughout the year the radio stations on St. Paul and St. George Islands. These stations have continued to render invaluable aid in the way of enabling the Bureau to keep in close touch with affairs on the islands during the long winter season when no other means of communication are practicable. The beneficial effect upon the Government employees of having some means of communication with the outside world in that season is well worthy of consideration.

On St. George Island a new building was erected by the Navy Department for use as an operating room and to provide quarters for the operator. The building was placed outside the village and is believed to be far enough away to insure its safety should any fire start in other buildings.

On St. Paul Island improvements were made to the local station by the Navy Department, and in connection with the work natives were given employment. As a result of their employment they received nearly $1,400 in cash. New buildings were erected, a number of large oil tanks were set up, and a fence was built around the area occupied by the station. A new well was dug, water from which is now used to supply the Bureau's tanks on Village Hill. During the process of the work a number of workmen and other employees of the Navy Department were afforded quarters in the Bureau's buildings.

PATROL OF THE NORTH PACIFIC OCEAN AND BERING SEA.

To assist in the enforcement of the provisions of the North Pacific Sealing Convention of July 7, 1911, the law makes it the duty of the President to cause a guard or patrol to be maintained in the waters frequented by the seal herd or herds and sea otter, in the protection of which the United States is especially interested, to be composed of naval or other public vessels of the United States designated by him for such service. Vessels of the Coast Guard exclusively have been utilized for this work.

In February, 1915, the President approved the recommendation of the Secretary of the Treasury that the Coast Guard cutters *Manning* and *Unalga* be designated for the patrol work in the season of 1915 and that the Coast Guard cutter *Bear*, which was to make an annual cruise to the Arctic Ocean, and the Coast Guard cutter *McCulloch*, which would be cruising in Alaskan waters, should enforce the provisions of the convention and the law at such times as might be practicable in connection with their other duties. Owing to the fact that there had been few, if any, attempts to carry on pelagic sealing in the previous three seasons, it was felt that the presence in the prohibited waters of but one of the two vessels assigned primarily to the patrol would be sufficient.

The *Unalga* left Port Townsend April 20, arrived at Unimak Pass the 29th, and continued on the patrol detail until July 17 when she was relieved by the *Manning* at Unalaska. The *Manning* continued the patrol work until September 12.

The Bureau is under obligation to the Coast Guard for many services rendered by its vessels in connection with the work at the Pribilof Islands.

SEALING PRIVILEGES ACCORDED ABORIGINES.

The North Pacific Sealing Convention of July 7, 1911, permits Indians, Aleuts, or other aborigines dwelling on the Pacific coast of America north of latitude 30° north to carry on pelagic sealing in canoes not transported by or used in connection with other vessels, and propelled entirely by oars, paddles, or sails, and manned by not more than five persons each, in the way hitherto practiced and without the use of firearms; and provided that such aborigines are not in the employment of other persons, or under contract to deliver the skins to any person. The act of Congress approved August 24, 1912, giving effect to this convention, restricts this privilege to the extent of prohibiting the killing of fur seals by any person within the 3-mile limit in waters of Alaska. So far as the Bureau is informed none of the natives of Alaska availed themselves in 1915 of their privilege. The Department of the Interior advised that no fur seals were taken in the year by Indians of reservations in the State of Washington.

DISPOSITION OF SKINS SHIPPED FROM PRIBILOF ISLANDS IN 1915.

The annual shipment of fur-seal skins and fox skins was made in September. The shipment consisted of 3,000 sealskins, 253 blue-fox skins, and 40 white-fox skins. The skins were transported from the Pribilof Islands to Oakland, Cal., on the Navy collier *Saturn*. From that point they were forwarded (with the exception of one skin, from an albino seal, which was sent to Washington) via the Southern Pacific and Union Pacific Railroads to Funsten Bros. & Co., St. Louis, Mo.

The fox skins together with the 256 blue-fox skins and the 25 white-fox skins shipped in 1914 were sold at public auction on October 21, 1915, by Funsten Bros. & Co. After deducting 2½ per cent discount allowed purchasers, the gross proceeds from the blue pelts were $57,257.85 and from the white pelts $1,556.10. After deducting broker's commissions, $2,352.56, certain storage charges, $25, and express charges on the 1915 shipment, $39.56, a balance of $56,396.83 remained as net proceeds. The freight charges on the fox skins shipped in 1914, amounting to $16.14, were included in a voucher stated previous to the sale and consequently this amount was not deducted from the gross proceeds of the sale.

The sale was successful from every point of view and unusually good prices were obtained for a considerable number of pelts. Five lots, consisting of 4 blues each, brought $1,092, $1,020, $1,012, $1,000, and $980, respectively. The prices obtained for the white-fox pelts ranged from a minimum of $17 to a maximum of $30 per pelt.

The 3,000 commercial sealskins shipped in 1915, together with the 2,896 shipped in 1914, and the 400 which were included in the 1913 shipment but withheld from the sale in December of that year, a total of 6,296, remained on hand in the States at the end of the year, December 31, 1915.

POSTPONEMENT OF SALE OF SEALSKINS.

It was deemed that market conditions did not warrant the sale of any fur-seal skins at any time in the year. Public resolution no. 65, Sixty-third Congress, approved February 24, 1915, amended the act of August 24, 1912, giving effect to the North Pacific Sealing Convention of July 7, 1911, in that it made discretionary with the Secretary of Commerce as to when the fur-seal skins taken on the Pribilof

Islands and then in the possession of the Government should be sold. This resolution did not apply, of course, to skins taken after February 24, 1915. To meet the condition which arose in respect to skins taken after that date in such manner as to permit the department to sell them most advantageously for the Government, the following resolution passed both Houses of Congress and was approved June 22, 1916:

JOINT RESOLUTION Authorizing the Secretary of Commerce to sell skins taken from fur seals killed on the Pribilof Islands for food purposes.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of Commerce be, and he is hereby, authorized to sell all skins taken from seals killed on the Pribilof Islands for food purposes under section eleven of the act of August twenty-fourth, nineteen hundred and twelve, in such market at such times and in such manner as he may deem most advantageous, and the proceeds of such sale or sales shall be paid into the Treasury of the United States.

DRESSING AND DYEING OF FUR-SEAL SKINS.

The first sale of Government fur-seal and fox skins in this country was held at St. Louis, Mo., on December 16, 1913. Previously the skins shipped from the Pribilof Islands by the Government had been sold in London.

In 1915 the Department of Commerce entered into a contract with Funsten Bros. & Co., of St. Louis, Mo., for the sale by auction of the Government take of fur-seal and fox skins for a term of years which contemplated that there should be established promptly in this country the best-known process of dressing and dyeing sealskins. The establishment of an industry of this character in this country is not only desirable in itself but it will also place the market for sealskins here upon a firmer basis. The actual treatment of raw sealskins was begun at St. Louis in December, 1915, and results subsequently obtained indicate beyond doubt that the finished product will be equal, if not superior, to any which has been produced elsewhere.

MINOR FUR-BEARING ANIMALS.

FIELD WORK.

Field work was carried on continuously throughout the year and as much of the territory was included within the scope of operations as was possible. The appropriations available for the year provided for seven wardens. While the primary duties of these wardens are to enforce the law and regulations for the protection of the fur-bearing animals and to secure information in regard to these animals, it has been found highly advisable to utilize the services of some of them from time to time in connection with matters pertaining to the fisheries. On the other hand, some attention has been given to the fur-bearing animals by employees who are primarily concerned with the fisheries.

One special warden, with headquarters at Chicken, was employed throughout the year at the nominal salary of $10 per month.

The wardens employed were Harry J. Christoffers, Ernest P. Walker, James H. Lyman, Fred H. Gray, Calvin F. Townsend, William P. Hemenway, Reginald F. Irwin, Harry H. Brown, Shirley A. Baker, and Christian L. Larson, special warden.

An unfortunate event was the disappearance of a party of three persons engaged in patrol work in southeast Alaska. Warden Irwin left Ketchikan October 9, 1915, on the hired launch *Frances R.* With him were Charles A. Clark, the master of the launch, and Mike De Costa, a cook. As the men did not return to Ketchikan within a reasonable time, a search was instituted. The launch was found wrecked in the Chickamin River, but the indications were that the mishap to the launch was a sequel to some accident to members of the party. The search for the missing persons was most thorough. It was participated in by officers and employees of the Government and by private citizens, and several vessels, public and private, were utilized. No satisfactory explanation has been made as to the fate of the men.

REGULATIONS.

In the early part of the year it was deemed advisable to revise the regulations for the protection of the fur-bearing animals. The new regulations were published in Department Circular No. 246, third edition, dated May 24, 1915.

In revising the regulations no change was made in the seasons for the killing of fur-bearing animals. The killing after July 1, 1915, of any fur-bearing animal in Alaska by means of the trap or device known as the "klips" or by means of any steel bear trap or any other trap with jaws having a spread exceeding eight inches was prohibited. No attempt was made to prohibit the shipping of live fur-bearing animals from Alaska. The policy of requiring persons who desired to engage in the business of breeding and rearing fur-bearing animals to secure licenses authorizing them to do so was discontinued, but permission to kill fur-bearing animals born and reared upon fur farms was made contingent upon compliance with certain requirements. While the taking in the close seasons of wild animals for use as breeding stock on fur farms was not restricted, the killing at any future time of animals so taken was forbidden.

Some hesitation was felt in the matter of removing all restrictions upon the shipping of live animals from the Territory. This was due in large measure to the demand in previous years for permits authorizing the shipments of foxes. But since the law did not expressly authorize the department to prohibit the shipment of live animals and since it was felt that the desire for Alaskan foxes for use on fox farms in eastern North America and elsewhere had passed its maximum, the policy of requiring permits for shipments was discontinued. In order to determine the amount of such shipments the collector of customs at Juneau was asked to keep a record of all shipments of the character in question. It developed that in the calendar year 1915 live fur-bearing animals were shipped from the Territory of Alaska as follows: 58 foxes, 34 minks, and 1 black bear. From another source it has been learned that foxes have been imported into Alaska, three pairs of silver gray foxes having been brought, presumably in 1915, from Edmonton, Alberta, for a ranch at Tolovana. It would seem that the absence of restrictions upon the exporting of live fur-bearing animals from Alaska had during the year no material adverse effects upon the natural supply of the wild stock.

The Bureau is not, however, assured that the demand for Alaskan foxes for outside use will not in the future reach such proportions as to affect unfavorably the fur industry of Alaska, and there should be legislation which will provide adequate authority to forestall such a contingency. It is not the number of live foxes shipped from Alaska which measures the injury to the resources of the Territory, for under proper conditions the exporting of live foxes is no more harmful than the killing of an equal number for their pelts. The real trouble is that the taking alive of each wild fox, when proper regulation of methods employed does not exist, means on the average the destruction of several other foxes.

In the fall of 1915 it became apparent that the decrease in the number of martens demanded a rescinding of the annual open season extending from November 16 to March 14. It was decided to place no restrictions upon the open season of 1915–16, but to provide that on and after March 14, 1916, the killing of martens should be prohibited until November 15, 1921. The formal regulation was promulgated early in 1916, in time to permit trappers throughout Alaska to inform themselves in regard thereto before making preparations for the trapping season of 1916–17. An examination of the table showing the statistics of minor furs shipped from Alaska (p. 139) will show the marked annual diminution year by year in the number of marten pelts shipped.

SEIZURES AND PROSECUTIONS.

One unprime red-fox pelt was seized in the latter part of the year from Frank Carroll, a resident of Copper Center, who had acquired it from a native.

On November 29, 1915, Assistant Agent Ball swore out three complaints against Paul Wolkoff, of Kodiak, charging him with the unlawful killing of two land otters and one silver gray fox. The defendant was tried and convicted on December 1 for the unlawful killing of a land otter and was sentenced to serve 60 days in jail and until the costs of the prosecution, amounting to $123, were paid. On the motion of Mr. Ball the other cases against the defendant were dismissed. One silver-gray fox skin and three land-otter skins were taken from him as being unprime.

In the latter part of the year separate complaints were filed before the United States commissioner at Kodiak charging Andrea Yakashoff with having unlawfully killed five foxes. The evidence was identical in respect to each of the five complaints. The defendant was tried December 2, 1915. A verdict of not guilty was found on the first charge and the others were then dismissed. The five skins involved, all of which were unprime, were seized and retained.

In December Ole Espland was arraigned before the United States commissioner's court at Copper Center charged with the unlawful killing of six cross foxes. The defendant pleaded guilty and sought clemency on the ground that he did not know the terms of the law and had no way of learning them except by hearsay. In view of what were considered extenuating circumstances a fine of but $1 was imposed. In this case the foxes while killed in the open season had been captured in the close season, the killing being in violation of the regulation which provided that fur-bearing animals captured in the close season should not be killed at any time.

On December 21, 1915, Charles Petersen, of Karluk, was arraigned at Kodiak charged with the unlawful killing of foxes. The defendant pleaded not guilty and asked for a jury trial. The jury returned a verdict of guilty and a jail sentence of four months was imposed.

On December 22, 1915, Peter Kewan, at Kodiak, charged with killing foxes by means of klipses, waived his right to trial by jury, and the evidence against him being conclusive he was sentenced to three months in jail.

The illegal killing of a land otter and a beaver was made the subject of a prosecution at Eagle, with the result that two persons were fined $25 each. As agents of the Bureau were not concerned with the case details were not obtained.

FOX FARMING.

Fox farming is receiving attention in various parts of Alaska and is concerned with the blue fox and the various color phases of the red fox. The rearing of blue foxes is confined chiefly to the coastal islands, where the animals may have considerable liberty. It is understood that attempts to breed blue foxes within limited inclosures in Alaska have been generally unsuccessful if not altogether so.[a] On the mainland of Alaska attention is given to the choicer color phases of the red fox. Both species are utilized in the Kodiak-Afognak region.

In reference to the color phases of the red fox the following extract is taken from a pamphlet prepared by Dr. Ned Dearborn, of the Bureau of Biological Survey, Department of Agriculture (Bulletin 301), on silver-fox farming in eastern North America.

> The name "silver fox," as commonly used by furriers, includes the dark phases of the ordinary red fox (genus Vulpes), variously called silver, silver gray, silver black, or black. It should not be confused with the gray, or tree, fox (genus Urocyon) of the United States, the fur of which is of comparatively little value. The color of the red fox of the northeastern States and of its allies of the colder parts of North America varies from red to black, and these extremes, with their gradations, form four more or less distinct phases, known respectively as red, cross (or patch), silver, and black. In the red phase the fur is entirely rich fulvous, except for restricted black markings on the feet and ears, a white area at the end of the tail, and certain white-tipped hairs on the back and rump. Grading into the next phase the black increases in extent until, in the typical cross fox, the black predominates on the feet, legs, and underparts, while fulvous overlaying black covers most of the head, shoulders, and back. A gradual increase of the black and elimination of the fulvous, or its replacement by white, results in the next phase, the silver (or silver gray) fox, in which the entire pelage is dark at the base and heavily or lightly overlaid with grayish white. The color of silver foxes varies from grizzly to pure black, except for a few white-tipped hairs on the back and rump. Finally, in the black phase, the white is absent from all parts except the tip of the tail, which is white in all four phases. The red phase is much more abundant than the others, but all four interbreed freely, and wherever one occurs occasional examples of the others may be expected. In general the cross fox is fairly common, the silver gray scarce, and the pure black very rare.

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[a] In this connection it may be stated that the superintendent of the National Zoological Park, Washington, D. C., has advised that some young blue foxes were received by the park in November, 1899, as a loan from the Semidi Propagating Co. It was understood that the foxes were shipped from the Semidi Islands, Alaska. Young were born each year from 1901 to 1906. Several litters were raised, but many of the animals died while quite young from uncinariasis, enteritis, nephritis, and anemia. There were also some losses from accidents and other causes.

It will readily be seen that a fox exhibiting one of these phases might be differently classified by different persons, and it should be borne in mind that the classifications of animals in this report have been furnished by various persons.

The Bureau regrets that many people have gone into the business of fox farming without much knowledge of its requirements, no facilities for caring for their stock, and apparently with no serious intention to pursue the business to any end. Dry-goods boxes, chicken pens, and old cabins do not make suitable retaining pens or breeding inclosures. The lack of a proper supply of water and the use of improper food further insure failure. A fox corral in the eastern part of the Territory, which was visited by a warden, consisted of an inclosure, 20 feet by 35 feet, made from logs set on end. No shelter of any kind was provided for the seven foxes on hand. The only seclusion which the foxes had was the holes which they themselves dug. No utensils for holding food or water were visible. Dried whitefish was the sole food supplied. The warden noticed that one fox was tied, asked for the reason, and was informed that it was sick. It is difficult to see how the owner, if he had any sincere intention of engaging in fox farming, could expect any degree of success. In some instances it is realized that a pretense of fox farming is made for the purpose of concealing illegitimate operations which could not well be carried on otherwise.

KODIAK-AFOGNAK REGION.

KODIAK FOX FARM

In 1914 the Kodiak Fox Farm, a copartnership, was organized at Kodiak for the purpose of propagating foxes. It was realized that fox farming in Alaska was largely undeveloped, and the organizers were fully prepared to conduct such experiments in the way of breeding, feeding, and caring for foxes as would assist in developing the industry in Alaska.

The copartnership consisted of Karl Armstrong, W. J. Erskine, N. Gray, and P. D. Blodgett. Mr. Erskine in behalf of the organization has furnished the department with an exhaustive account of their plans and work, and in the interest of the industry it is deemed desirable to reproduce the report in part, as follows:

SELECTION OF LOCATION.—The selection of a proper location for a fur farm is, of course, a matter that should be given the most careful consideration by one who contemplates undertaking this business. While a well-situated island, of the right size, and having the necessary natural facilities for economically conducting a ranch—of which there are many unoccupied along the coast of Alaska—is by far the better sort of a location for a fur farm; still there are thousands upon thousands of acres on the mainland of Alaska that are well adapted for this purpose and that probably could not be utilized for any other business. Where a ranch is located on the mainland the foxes must of necessity be kept in captivity; but if an island is chosen, one can either keep the animals in corrals or permit them to run at large, or both methods could be resorted to at the same time. An island ranch also has the advantage of furnishing more complete isolation against outside interference with the foxes, and there is better assurance against total loss if an animal escapes from the inclosure.

Long Island, situated about 7 miles from Kodiak, was selected as the location of the Kodiak Fox Farm. This island is an ideal one for the purposes intended, and is near enough to Kodiak—the home of the four members of the firm—so that the management of the ranch can be given the personal supervision of those interested. Long Island contains about three square miles of low rolling hills, is partially timbered with spruce, affording some most excellent locations for corrals, and is bountifully supplied with water from numerous small lakes and streams. The waters surrounding the island abound with fish, such as cod, halibut, flounders, salmon, etc. There are several beaches where clams and mussels may be secured at every low tide, and in the spring of the year large quantities of eggs can be gathered from the adjacent rocks where sea birds nest in numbers. With all these at hand a cheap supply of excellent food for the foxes is assured. Wild berries also grow on this island in great quantities, and our experience has taught us that these can be fed to advantage.

METHOD OF FOX RANCHING.—Fox ranching in Alaska is not a new industry by any means, but the methods under which it has been conducted were such that most of those who attempted it have met with but indifferent success. In fact, but very few have made better than mere wages for the time and effort devoted to it, and still fewer have succeeded in reaping a profit in keeping with the capital invested and energy expended in the care of their ranches.

In selecting a method of fox farming the choice must be between two systems—that of breeding the animals in captivity, which has been proved so successful by the Canadian farmers with black foxes, and that of allowing them to run at large on islands, the practice most in vogue among Alaskans with blue foxes. While we are in favor of the former method as offering far more possibilities, still there are certain advantages to the latter, and where a ranch is situated on an island both systems might be resorted to simultaneously.

The chief advantage in permitting the foxes to run at large is that the initial cost of establishing a ranch is materially less than the investment necessary for the construction of corrals and inclosures; and for this reason it is possible for some who can not afford to undertake the business of raising foxes in captivity, to liberate a few animals on a suitable island. By giving such a ranch careful attention, the profits accruing—especially with blue foxes at present prices—should be in keeping with the capital invested and cost of operation; still, the mere fact that the percentage of loss of young foxes on the islands in Alaska has been so great, is a strong argument against this method. Mr. Samuel Applegate, who has had a great deal of experience propagating blue foxes liberated on islands in the Aleutian group, and who has given the subject very careful study, has clearly demonstrated that the blue fox can be successfully raised under the system that has been generally adopted, provided proper intelligence and care are exercised in handling the business. Even with the remarkable results he has been able to accomplish, however, he states that under this system only a small percentage of the pups born are raised to maturity, and places the average mortality among the young animals at 75 per cent. (Alaska fisheries and fur industries in 1913, Bureau of Fisheries document 797.) If this statement is correct—and we have every reason to believe the estimate is a conservative one—it means that only two pups of every eight born reach maturity, or an age where they are of any value. Such an enormous loss may eventually mean failure, and the only way we see that it can be avoided, or reduced to a minimum, is by breeding and caring for the animals in captivity. On Prince Edward Island, for instance, where all fox ranchers rear their animals in corrals, the mortality seldom exceeds 25 per cent; and in some cases, even on large ranches, as high as 100 per cent of the pups born have been successfully raised. In our short experience in this business we can testify that we have raised every fox that was born on our ranch this year. It is true that we had but five pups born; still it is a fact that three of these certainly would have died if they had been at large, and could not have been given the extreme care necessary when they were sick. The value of these three foxes saved, we figure, repays us to a considerable extent for the cost of our corrals.

If foxes are to be bred and reared according to scientific principles, and with any hope of improving the stock and quality of fur produced, then the animals must be raised in captivity. This system permits of selective breeding, a thing that can not be accomplished if the foxes are allowed to run at large, and also provides a means of eliminating undesirable animals from the breeding stock. It also furnishes an opportunity of giving the foxes individual care and attention at all times, and reduces to a minimum the chances of loss from the many causes that are known to exist on the islands where foxes are given their liberty.

All the members of the Kodiak Fox Farm have had many years of experience in Alaska and excellent opportunities to observe the methods practiced by the fox ranchers and to note wherein mistakes have been made. Aside from their knowledge of local conditions, they have investigated as fully as possible the results of fur farming ventures in the United States and Canada, and from the data gathered on the subject, decided upon the system of fox propagation that is now in use on Long Island.

LITERATURE ON FOX FARMING.—Much information was obtained on the subject of raising foxes in captivity from the excellent report of the Canadian Commission of Conservation, entitled, "Fur Farming in Canada," by J. Walter Jones. This book is by far the best work we have seen on this interesting subject, and should prove of inestimable value to those engaged in fur farming, or who contemplate undertaking this business. Farmers' Bulletin No. 328, of the United States Department of Agriculture, entitled, "Silver Fox Farming," by Wilfred H. Osgood, also contains much valuable information, but the work does not treat the subject as exhaustively as does the Canadian report. The Silver Black Fox, a monthly magazine published in St. John, New Brunswick, and devoted exclusively to this industry, contains many valuable and interesting articles.[a]

CARETAKER.—Since the primary object in raising foxes in captivity is to be able to give them exceptional care, then the selection of a proper caretaker becomes an important consideration. We have been most fortunate in securing the services of Durrell Finch, and we believe that if any man of his capabilities attempts this business, success is bound to result. Mr. Finch was formerly a stockman in the Middle West, and seems to have a natural intuition as to how animals should be handled. For about 20 years he has been in Alaska, and for a good part of that time was in charge of a station belonging to the Alaska Commercial Co. where a great deal of fur was handled. Mr. Finch is responsible for a breed of sled dogs among which are found some of the most hardy and intelligent in the country. This he accomplished by crossing the St. Bernard with the Husky, and then carefully selecting his breeders from the resulting pups. With this experience, and being naturally fond of animals, he is particularly well fitted for the work of caretaker.

One of the partners of the firm, Karl Armstrong, who acts as manager, is also of valuable assistance in conducting the ranch. He was also formerly a stockman, and the breeding of a thoroughbred line of field dogs has been for years his hobby. The services of a veterinary surgeon may be entirely dispensed with when Mr. Armstrong is available, for he can amputate the leg of a fox, administer a dose of medicine, and handle a wild animal as well as anyone.

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[a] In this connection the Bureau invites attention to Department of Agriculture Bulletin no. 301, Silver Fox Farming in eastern North America, by Dr. Ned Dearborn. The bulletin is a contribution from the Bureau of Biological Survey.

In order to succeed in the breeding of wild animals, one of the first aims should be to induce them to become as gentle as possible. One of the partners has remarked that, "it takes a gentle man to rear a gentle animal," and in this we are particularly fortunate in having the services of Mr. Armstrong and Mr. Finch.

Corrals.—Considerable time was spent in prospecting the various possible locations on Long Island before a final selection of a site was made, and this is a thing that should always be given thoughtful consideration when establishing a ranch. The ground we finally decided upon is on the top of a low ridge in the thick spruce timber and has a slate bed rock lying from 2 to 3 or 4 feet below the surface. This location assures us of a well-drained place for the corrals, and even in the season of heaviest rain there is no mud under foot. The timber affords the necessary shade in summer and protection against the severe weather of winter, and the fact that the bedrock is so near the surface makes us doubly secure against the chances of having the foxes escape by burrowing.

In 1914, when the Kodiak Fox Farm was established, the inclosure built for the foxes consisted of 12 breeding corrals and 12 male pens. The breeding corrals are 23 feet wide by 50 feet long, and the male pens are 4 feet wide, placed between the corrals, and extending the full length of 50 feet. The plan showing the arrangement is illustrated on page 117.

The fences were built 8 feet above the ground, and it was intended simply to run a 2-foot strip of heavy netting around the top to prevent escape of the foxes. Upon an inspection of the corrals, however, after the completion of the fence on this plan and before the overhang wire was put on, it was decided to cover them completely with netting, for it seemed to us that a fox would have but little trouble in escaping from corrals constructed as ours were. Consequently, before the animals were put in the inclosure, netting of no. 20 wire, 2-inch mesh, was ordered, and the corrals completely covered with it. Our fears were well founded, for the first day that foxes were put into the corrals one of them escaped by climbing the fence and working a hole through the light covering wire. We then ran a strip of heavy wire netting, 2 feet wide, around all the corrals, on top of the covering wire and laced to it, and since doing so have had no further difficulty. Our mistake was in using too light a wire for this purpose, and in the new corrals built this year the fault has been remedied.

As stated previously, the bedrock where these corrals were built is not more than 4 feet below the surface. In constructing the corrals, therefore, ditches were dug to bedrock, following the lines of the fences, and the posts set so they would extend 8 feet above the surface. In order to prevent the foxes escaping by burrowing under the fence, a strip of heavy wire netting, no. 14 gauge, 2-inch mesh and 3 feet wide is securely fastened to the sill that lies on the surface of the ground, and allowed to extend to bedrock. In cases where the netting was not quite wide enough to reach the bedrock, a log was placed in the bottom of the trench and the lower side of the wire was fastened to this.

For the fences, above ground, two strips of wire netting were used, each 4 feet wide and 2-inch mesh. The lower strip is no. 14 gauge and the upper no. 15, and the two are joined by being stapled to a center rail of the fence.

Improved corrals built in 1915.—In the construction of our new corrals, built in 1915, a number of improvements have been made. (See detailed plan of these corrals on p. 116.) Instead of using logs and rails from the woods, sawed timbers have been utilized in the construction of these corrals, the result being a considerable saving in the cost of labor and a great improvement in the appearance of the ranch.

An important feature of these corrals is that double-wire fences have been used throughout; this as an additional precaution against escape, and also to prevent the foxes from being injured by fighting through the wire netting. For the same reason double ground wires have been resorted to. As a further protection against the possibility of foxes liberated on the island coming in contact with those in the corrals, the lower half of the inside of the outer fence is covered with netting of 1-inch mesh,

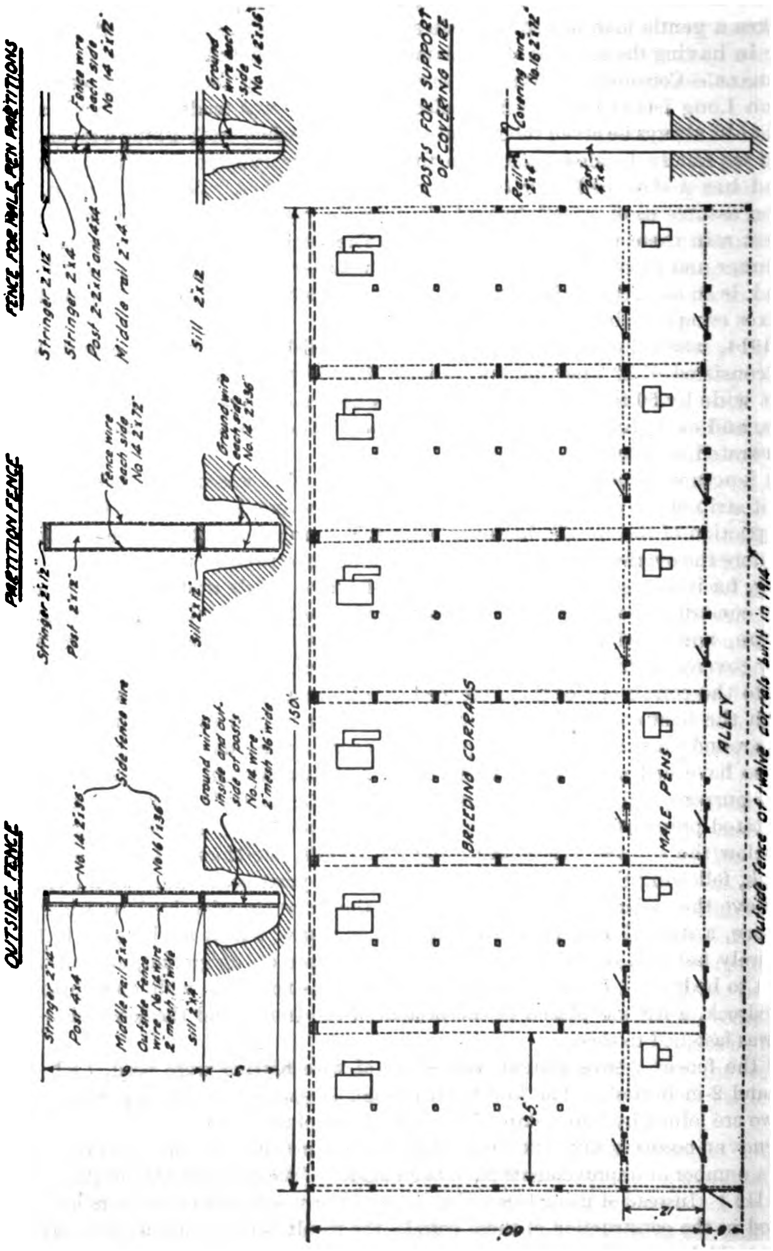

FENCE FOR MALE PEN PARTITIONS
Stringer 2"x12"
Stringer 2"x4"
Post 2-2"x12" and 4"x4"
Middle rail 2"x4"
Sill 2"x12"
Fence wire each side No 14 2"x12"
Ground wire each side No 14 2"x36"
PARTITION FENCE
Stringer 2"x12"
Post 2"x12"
Sill 2"x12"
Fence wire each side No. 14 2"x72"
Ground wire each side No. 14 2"x36"
OUTSIDE FENCE
Stringer 2"x4"
Post 4"x4"
Middle rail 2"x4"
Outside fence wire No. 14 wire 2" mesh 72" wide
Sill 2"x4"
No. 14 2"x36"
No. 16 1"x36"
Side fence wire
Ground wires inside and outside of posts No. 14 wire 2" mesh 36" wide
9'
6'
POSTS FOR SUPPORT OF COVERING WIRE
Covering wire No. 16 2"x12"
Rail 2"x6"
Post 4"x4"
150'
BREEDING CORRALS
MALE PENS
ALLEY
Outside fence of twelve corrals built in 1914
25'
21'
60'

FIG. 1.—Plan of improved fox corrals built by the Kodiak Fox Farm during season of 1915.

no. 16 gauge. The entire structure is covered with wire netting, 2-inch mesh, and no. 16 gauge.

The location of the male pens has also been changed in the new corrals. Instead of placing them between the breeding corrals, as was formerly done, we have partitioned off 12 feet of the front end of the latter, thus affording a pen of better proportions. A door or gate connects the breeding corral with the male pen, and except

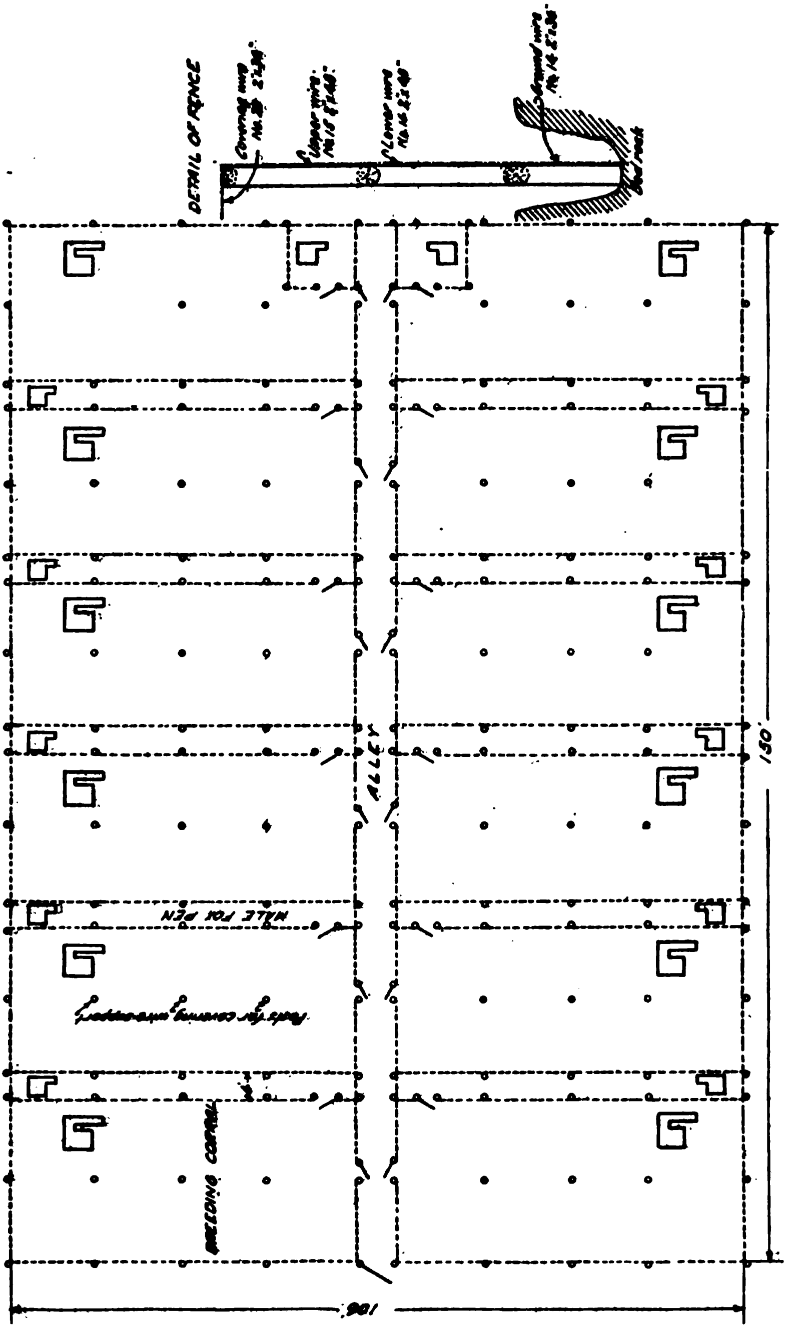


FIG. 2.—Plan of twelve corrals built by the Kodiak Fox Farm in 1914.

during the period when the male is separated from the female, the pair may have the run of the entire inclosure, an area of 1,500 square feet.

It will be noted that the fences of the new corrals are but 6 feet in height, which we have demonstrated is sufficient height in this country, where the snowfall is light. In a district where the snow is apt to exceed 2 feet in depth, the height of the fence should be increased accordingly; also, if no covering wire is used, the fence should be at least 10 feet high. Aside from the fact that a considerable saving in construction cost is effected by building low fences, the danger of the foxes being injured by falls is greatly lessened. Foxes are great climbers, and it often happens that they are seriously injured by falling from high fences.

Many of the fox ranchers have constructed their corrals so as to allow a passageway around each one. This plan, of course, acts as a safeguard against the foxes fighting through the wire, but we think there are objectionable features in this method of building the inclosures, and that the general scheme we have followed will better serve the purpose. The nest houses in our corrals are placed at the end farthest from the entrance, so it is not necessary for the keeper, when feeding and otherwise caring for the foxes, to approach nearer to the nests than just inside the entrance gate of the corral. This is an important matter, for during the period of gestation, and until the pups are weaned, extreme caution must be exercised not to disturb or excite the female. With passageways completely surrounding the breeding corrals, there is apt to be a tendency to disturb the foxes at a time when they should be left entirely alone, and for this reason the plan of construction should be given careful consideration. By following our plan of construction the chances of accident from the animals fighting through the fences will surely be eliminated, and then the cost of construction will be considerably lessened. Fewer posts will be required for the corrals; and in case the ranch is situated where an outer inclosure is necessary, considerable expense can be avoided from the fact that a smaller area will have to be surrounded.

Care must be exercised in the selection of wire netting, and this should be the grade that is galvanized after weaving. Nothing lighter than no. 14 wire should be placed under ground, and we would recommend, when it is possible to secure a heavier weight, the use of no. 12. For the fence wire we believe that nothing lighter than no. 14 should be used; some of the foxes are large and very strong, and by continually biting and pulling at one place in the fence a hole might easily be made if the wire is not of sufficient weight. For the covering wire no. 16 is heavy enough, but we think it would be dangerous to use anything lighter. Two-inch mesh might be used with safety for all the netting, although the use of 1-inch mesh wire for the lower half of the fences has its advantages. Any netting with larger mesh than 2 inches, however, should not be used in the construction of fox corrals.

In fastening the wire netting to the posts and stringers a liberal supply of staples should be used. We recommend galvanized staples, 1½ inches long and of no. 9 gauge.

Instead of using a lacing wire for connecting the strips of netting, as is done generally in constructing fox corrals, we have found that galvanized hog rings make a much better, cheaper, and neater job. These are used by fishermen on the Pacific coast for building fish traps of wire netting, and can be secured from any house that deals in salmon cannery supplies. The rings are easily and quickly applied by the use of a hog ringer.

Our advice generally, to those who contemplate going into the fur-farming business, is not to attempt to economize on the material that goes into their corrals. Only the best material and workmanship should be considered, for the fox is a valuable animal, and the loss of a single animal through improperly constructed inclosures might represent a sum greater than the entire cost of the structures.

Nest houses.—In the construction of the nest houses, or artificial burrows, in which the male and female are to live for a good part of the year, and where the female is to whelp and rear her young to the weaning stage, the greatest care should be exercised. Our nest houses have been built on the lines suggested by J. Walter Jones in his Canadian report, but the plan has been somewhat altered through information gained by conversation and correspondence with parties who have had vast experience in breeding foxes. These are, we believe, thoroughly suited to the purposes intended. In fact, the results obtained during the past season in the use of these houses have been so satisfactory that the structures now being put into the new corrals are identical, except that the nests have been made 18 by 22 inches instead of 16 by 20 inches. This change was made to accommodate some of the exceptionally large foxes, as it was feared the nest might be somewhat crowded during the whelping season if made in the smaller size. These houses have been built with the idea of furnishing a shelter as nearly as possible like the natural burrows, and at the same time adding features that would improve the sanitary conditions and make the nests accessible for inspection, cleaning, etc.

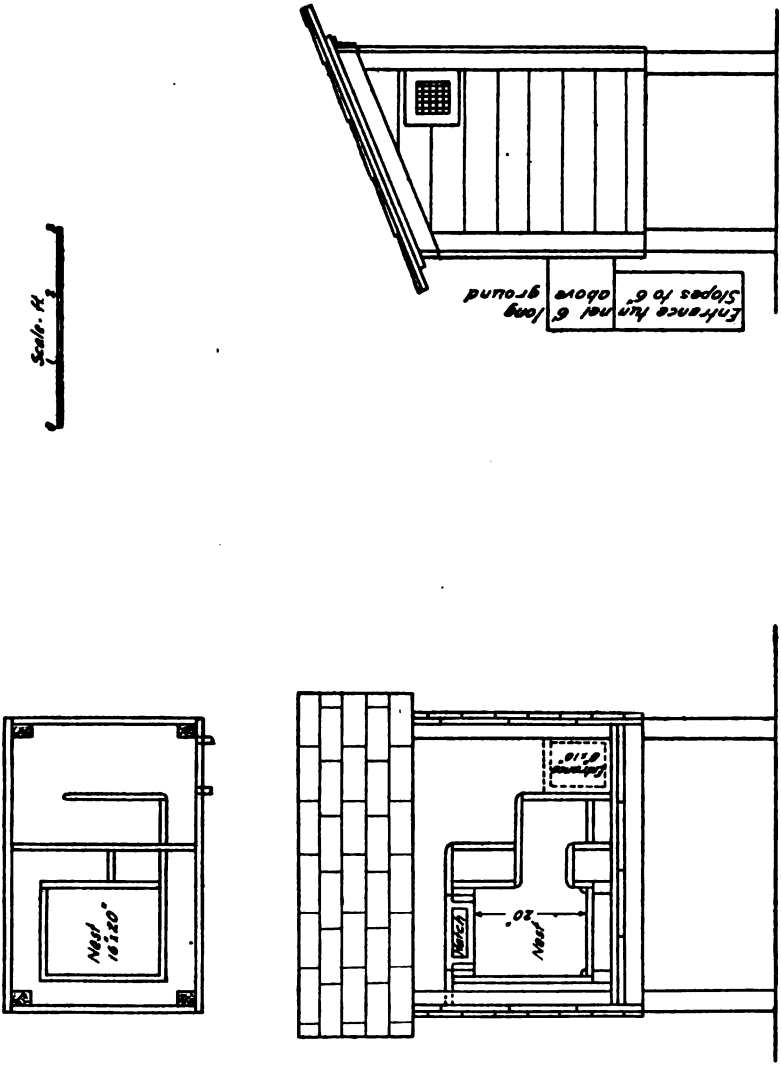


Fig. 3.—Plan of fox houses, Kodiak Fox Farm.

Above is a drawing of these houses showing general method of construction and arrangement. The hatch, which is the nest cover, is easily removed in order to get at the interior of the nest, and for the purpose of facilitating this operation three auger holes are bored through the top and bottom boards of the hatch. By placing one's fingers in the top holes the hatch can easily be lifted, and at the same time these holes serve as a means of ventilation for the nest. The hinged roof makes the interior of the house very easy of access.

The nest, in order to assure warmth, is completely surrounded by a dead air space, accomplished by the use of double walls and covering the air space side of the nest walls with building paper. In an extremely cold climate it would probably be well to insulate the nest further by filling the air space with planer shavings, sawdust, or some other such material. In this section, however, the air space affords sufficient protection against the cold.

The interior of the house is finished entirely with dressed lumber, and all sharp corners are rounded off to prevent injury to the fur. Great care is also taken to be sure that no nails are left protruding that might injure the fox or his fur.

The floors are of 1-inch boards, doubled, and with building paper between. The walls are of 1-inch lumber, covered with building paper, and then with either shingles or weather boards. The roof is shingled over 1-inch lumber, and is hinged at the upper side.

To afford ventilation in warm weather, two small windows are provided, one at each end of the house near the roof. These are 5 inches square and are filled with wire netting. A wooden cover is arranged to button over the windows in cold weather, or whenever it is desired to close them. A favorite place of refuge for the foxes is the space on top of the nest, where they can keep safely out of sight, but at the same time watch what is going on by peering out of the windows.

To protect these houses against the weather we have painted them with two coats of good paint.

MALE FOX SHELTERS.—The male fox is taken away from the female shortly before the pups are due, and for this reason it is necessary to provide a suitable shelter for him in the male pen. At first we built small houses, 2 by 3 feet inside measurements, with a shed roof and a tunnel entrance having an opening 8 by 10 inches. The house was completely covered with three-ply roofing paper. In the new corrals, however, lard tierces have been used for the male-fox shelters. The tierce is laid on the ground and a board is fitted in the lower side to serve as a floor. The bottom is left in, but the head is removed, and over the opening is tacked a piece of heavy sail canvas, the lower side being left loose and a slit being cut down the center. This makes an easy means for the fox to enter or leave the shelter, and at the same time provides ample protection against the weather. In the side of the tierce, and under the flat floor, a small auger hole is bored in order to drain any moisture.

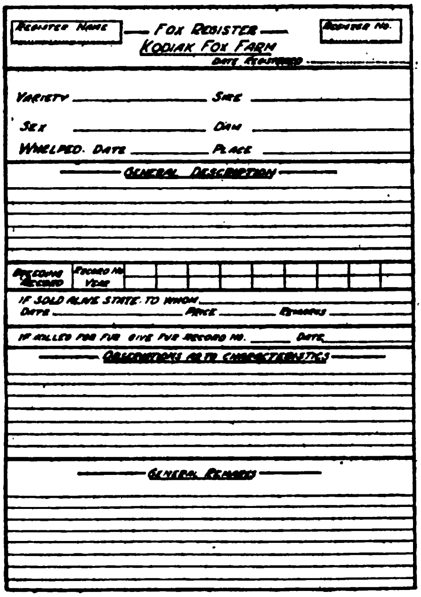
CAPITAL REQUIRED.—We estimate that each corral, complete, with nest house and male fox shelter, costs about $200. There might be a slight variation from this figure, depending upon locality, cost of labor and of material, manner of construction, etc.; but in estimating the capital required for raising foxes in captivity one should figure on at least $200 per pair to cover the actual cost of building proper inclosures and shelters. A person of limited means, who might contemplate raising foxes in captivity, should bear in mind the cost of a properly equipped ranch, and should gauge the number of foxes he can afford to care for accordingly. We believe there is a far better chance of success for one to attempt this business on a small scale to begin with, and be certain that the animals are well corralled and housed, than to start with a large number of foxes that can not be properly cared for on account of lack of capital.

Adequately to equip a ranch for 10 pairs of foxes, in Alaska, one must figure on a fixed investment about as follows:

Ten corrals, complete, at $200	$2,000
Dwelling for keeper, together with the necessary outbuildings, say	1,500
Boats, tools, implements, household furniture and fixtures, say	500
Total	4,000

The cost of black foxes, if caught from the wild, will run all the way from $300 to $1,000 or over per pair. If good ranch-bred stock should be purchased, then the cost would probably exceed to a considerable extent the latter figure. We think, however, that $400 per pair is the very least that one could figure on for wild stock.

In addition to the above amounts, one must also take into account the cost of conducting the ranch for at least a year, or until it becomes productive, and for this item alone not less than $1,000 can be safely figured on, even if the owner does his work without an assistant. Therefore, a 10-pair ranch of black foxes, at the time when the first litters are born, would represent an investment of not less than $9,000, and this figure does not cover contingencies that are likely to arise. We think it safe to say that one undertaking this business should have available a sum not less than $900 or $1,000 for each pair of foxes put into corrals, or from $500 to $600 per pair in addition to the actual cost of the foxes.



Register Name — Fox Register — Register No.
Kodiak Fox Farm
Date Registered

Variety ____ Sire ____
Sex ____ Dam ____
Whelped. Date ____ Place ____

— General Description —

Breeding Record	Record No.									
	Year									

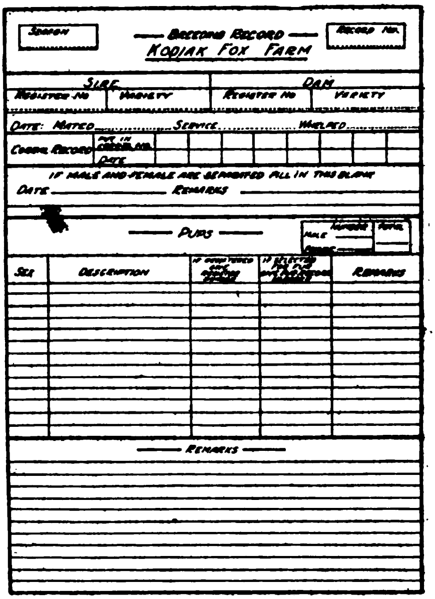
If sold alive state to whom ____
Date ____ Price ____ Remarks ____

If killed for fur give fur record no. ____ Date ____

— Observations as to characteristics —

— General Remarks —

Fig. 4.—Fox register, Kodiak Fox Farm.



Season — Breeding Record — Record No.
Kodiak Fox Farm

Sire		Dam	
Register No	Variety	Register No	Variety

Date: Mated ____ Service ____ Whelped ____

Coupl. Record	Put in corral no.								
	Date								

If male and female are separated fill in this blank
Date ____ Remarks ____

— Pups —

	[illegible]	Total
Male		
Female		

Sex	Description	[illegible]	[illegible]	Remarks

— Remarks —

Fig. 5.—Breeding record, Kodiak Fox Farm.

While the investment necessary for stocking and equipping a ranch on the above basis represents a considerable sum, still it is small when compared with the enormous amounts for which many of the fox ranches in Canada and the Eastern States have been incorporated. In Canada, for instance, fox companies have been incorporated from $11,000 to $31,250 per pair, and entire stock issues have been disposed of at these rates.

Only the fact that fabulous prices have been realized during the past four or five years for breeding stock has made it possible for companies capitalized for such excessive amounts to pay dividends. It would seem that the sole aim of most of these fox companies has been to rear and dispose of stock for breeding purposes; that very little attention has been given to the production of pelts, and as a matter of fact a small percentage of the foxes produced of late have been sold for fur. As a natural consequence of this system, the production of breeding stock will soon exceed the demand, and then the value of animals raised will be gauged by what the fur can be sold for on the market. As the time approaches when breeding stock is less in demand, therefore, and when the profits of a ranch will have to be in accordance with the pelt value of the production, then the natural inclination will be to capitalize such ventures with some degree of moderation. In the meantime, of course, those companies which have been capitalized at such excessive amounts will naturally feel keenly the effect of a materially reduced earning power. Undoubtedly a live fox of known pedigree and breeding qualities is worth considerably more than his pelt would bring in the market; still, there should not be such a vast difference between the fur value and the value of the live animal as has existed during the past few years. Such excessive values, necessitating overcapitalization, tend to detract from the stability of the industry at large, and it is hoped that in Alaska the inclination will be not to fall into this error, but to hold the price of breeding stock down to something like the pelt value.

Alaska seems to offer particular advantages for the business of fox propagation, and the fact that it can be undertaken here with so much less capital than is required elsewhere should be a strong factor in building up this remunerative industry.

Records.—In order to attain the points desirable in ranch-bred foxes, most careful attention must be given the recording of the animals, and in such a way that pedigrees can be easily and accurately traced. We are working on the theory that, by selective breeding, these qualities can be achieved, and the record forms we are using for this purpose seem to meet our requirements in this respect. On page 121 we illustrate the forms used for our Fox Register and Breeding Record.

The Prince Edward Island fox ranchers have organized a breeders' association through which black foxes, under certain restrictions, will be registered, and all foxes so recorded are branded by indelible tattoo marks in one ear. The branding is probably necessary where so many owners are represented on the register; but in our case, where only our own animals are to be recorded, we think the plan we have adopted for keeping track of the various breeding foxes is adequate for all purposes.

All our breeding corrals are numbered, and a note is made on the Breeding Record of the register number of each fox placed in the corral. In case a pair is changed from one corral to another, this fact is noted; and in the event that for any reason the mates are changed, a new Breeding Record is opened. No attempt is made to register the pups until they are sufficiently mature to enable us to choose intelligently those which are best suited for breeding purposes. The breeders are then registered, and those selected for fur are entered in the Fur Record in proper time.

When the pups are taken away from the mothers each litter is placed in a separate rearing pen. These pens are also numbered and a record of this number is noted on the Breeding Record. With this method there is no chance of getting the foxes mixed in any way, and the necessity of relying upon tags or brands is entirely obviated.

In the Fur Record is entered a complete description of each skin taken from the ranch. It further shows the market fluctuations, as determined by the London sales and others, and thus serves as a guide in placing valuations on furs.

A further record is kept which is called the Ranch Log. In this the keeper records memoranda of daily occurrences on the ranch, making special note of characteristics of foxes, habits, kind and quantity of food given, etc. A copy of this log is kept in the office for reference and it is found of great value in many ways. This book makes very interesting reading for one in any way connected with the raising of foxes and really furnishes a continuous narrative of the daily operations of the ranch.

The principal points at which we aim in our breeding operations are color, texture of fur, size, disposition, and prolificacy. By carefully maintaining the records described above, we believe our efforts along these lines will be greatly facilitated.

Feeding.—The proper feeding of foxes is, of course, one of the most important matters to be considered in this business. We have tried many experiments along these lines, and are convinced that fish can safely be made the chief item of diet.

While the foxes relish almost any kind of fish, still it has been noticed that an occasional change in variety is desirable. The coast of Alaska, together with the adjacent islands, offers excellent opportunities to secure an abundance of fish, and probably at much less cost than the same quality of food could be secured in any other locality where it might be possible to raise foxes successfully.

Codfish, halibut, sculpins, rockfish, and flounders are to be had in quantities throughout the year, and the foxes are very fond of all these. The fish are cleaned carefully, then chopped in pieces weighing from 1 to 3 or 4 ounces and fed raw. The healthy livers from the codfish are also saved and fed. Dog salmon, pink salmon, silver salmon, and fresh red salmon heads from the cannery are fed during the season when these fish are obtainable.

Probably the article of fish diet most relished by the foxes, however, is the salmon head, and these can be obtained in almost unlimited quantites if the ranch is situated near a salmon cannery. We discovered the liking the foxes have for salmon heads when feeding fresh salmon during the past summer. It was noticed that, without exception, the pieces of the heads were always the first eaten. We therefore made arrangements with the cannery of the Kadiak Fisheries Co., situated at Kodiak, to take such fish heads as we might require, and they gladly gave us these without charge. As an experiment we mild-salted about 15 barrels of heads and these serve as an excellent food for winter. Before feeding the salted heads, however, they are taken out of the brine and soaked in running water for 60 or 70 hours, when they are sufficiently freshened to be fed without danger. Our keeper, fearing that these salted heads might be injurious to the animals, was at first rather reluctant about feeding many of them, so we decided to experiment on one fox. A cross fox of little value was selected for this; he was put in a pen alone and was fed nothing but pickled salmon heads, freshened first by soaking, and as many of them as he would eat. The result was that he thrived on this diet, grew fat, and his coat became as sleek as any other fox on the ranch. The blue foxes at large on the island also relish the fish heads. They are fed once a day on a platform built for the purpose near the keeper's residence, and here is placed an assortment of food, including a supply of salmon heads. Often some of the food is left, but it is a noticeable fact that the heads are always cleaned up.

It might be in order to make a suggestion here. We understand considerable difficulty is at times experienced on the Pribilof Islands in securing sufficient food for the blue foxes, and this could be overcome, we believe, by the use of salmon heads. The heads could be secured from the canneries in Bristol Bay, where hundreds of tons of them are thrown away each year; the cost would be far less than for any other kind of food that might be shipped to the islands, and we are certain the results of feeding them to the foxes would be most satisfactory.

Another fish food which has been found to be excellent for foxes is dried salmon backs, or "ukula," as prepared by the natives. The salmon is dried in the sun and wind until it is quite hard and tough and is given to the foxes in this condition. It is particularly good for the young animals while teething, for it affords something substantial for them to chew on, a thing that is quite necessary during this period.

Canned salmon is used to quite an extent by a number of the fox ranchers, including ourselves. Short-weight cans are obtained direct from the canneries at nominal prices; the foxes eat this very readily and it is generally considered a good food to give occasionally. In fact, several of the ranchers in this vicinity feed canned salmon almost exclusively, especially during the winter months, and all reports we have received regarding this practice have been satisfactory.

As a further variety in the fish diet, we make it a point to take advantage of the extreme low tides in order to secure a supply of clams and mussels, both of which are usually very plentiful. The foxes are very fond of these and relish an occasional meal of them.

Such birds as sea ducks, cormorants, magpies, crows, etc., are very plentiful along the coast of Alaska, and when given to the foxes they are always devoured ravenously. The keeper, in order to secure these birds, is supplied with a shotgun and ammunition.

As a further source of food supply, and in order to furnish still more variety in the regular diet, we have propagated Belgian hares on Long Island. These are very prolific breeders, are cheaply and easily raised, and make excellent food for the foxes.

We make it a point, when a beef is slaughtered at Kodiak, to secure the scraps, legs, head, etc., and send them to the ranch for the foxes. While the animals all seem to prefer the fish, still they will eat the beef scraps and gnaw at the bones. The bones are very good for the young teething foxes.

A few cases of Spratt's Patent Fox Cakes are kept on hand. These cakes, similar to the dog cakes manufactured by Spratt's Patent (Ltd.), have been extensively fed by some of the Canadian fox ranchers, and from reports we have received are considered a very satisfactory food. We feed these occasionally with very good results.

The fox is also very fond of fruit, and we see to it that he has his regular ration of fresh apples, stewed dried peaches, figs, etc. During the summer, when wild berries are plentiful, these go to make up a part of the daily ration.

The fox is a dainty animal in his feeding and at times rather erratic. The same diet will not always do for every animal, and for this reason the keeper must study their individual tastes. Occasionally a fox will become sulky and refuse to eat, so it then becomes necessary to endeavor to tempt his appetite. For this purpose the table scraps from the keeper's house, such as meat, bones, potatoes, rice, mush, etc., are saved and offered to those foxes that do not take readily to the regular diet. In at least two cases we have had foxes actually starve themselves to death.

The quantity of food given must also be regulated in accordance with the particular needs of each animal, and in this the keeper must be a keen observer and exercise good judgment. The fox should be fed once a day, in the evening, and given just enough food to keep him in good condition, neither too fat nor too poor. With a little care, and by intelligent observation, one can soon learn from experience the peculiarities of the foxes, and govern his method of handling and feeding them thereby. Often, when there are two foxes in a corral, one will endeavor to secure the lion's share of the food, so the keeper must be watchful in order to see that each gets its share.

During the period of gestation, and while the females are nursing their young, they are fed very liberally. In fact, their appetites are tempted with such delicacies as eggs, milk, bread dipped in soup stock or gravy, etc. A good milch cow would be a valuable adjunct to any fox ranch, but where this is impracticable a supply of canned evaporated milk will answer, but it should not be fed without first reducing it with water to the consistency of cow's milk. As a rule our foxes took to milk readily and relished it; but in one instance a female fox that was expected to whelp, and for that reason we were very anxious that she should receive the very best food, positively refused to touch milk that was put before her in a pan. As it happened, however, this animal was particularly fond of clams which had been fed to her in the shells. Our keeper finally hit upon the idea of putting milk in clam shells, and in this way he was able to induce her to drink all the milk that was offered.

The young pups, when about 2 months old, are taken away from the mothers and, of course, must be fed very carefully for several months. Food should be given them several times a day in small quantities, but one should be sure that while growing they get all they want to eat. A liberal supply of milk is very necessary, especially when the pups are first weaned; but in a short time they can be fed about the same variety of food that is given the mature animals. It is best to leave the pups with the mother as long as she will properly care for them; but as soon as she shows signs of annoyance the young should be taken away. A pamphlet on the care of puppies, issued by Spratt's Patent (Ltd.), contains some very good advice and suggestions that would apply to young foxes as well as dogs.

In selecting a site for a fox ranch one should keep in mind the absolute necessity of an adequate supply of good pure water. The foxes do not drink a great deal, especially during the winter when snow is on the ground, but what is given them should be pure, and the vessels in which it is given should be cleaned out at least once a day. Foxes are inclined to soil the water, and in order to avoid sickness it should be changed as often as practicable.

SANITATION.—We make it a point to take every precaution to guard against insanitary conditions on the ranch, and particularly in and about the corrals and pens. All refuse is cleaned up regularly; only enamel-ware pans and basins are used for food and water, and these are carefully washed every day with hot water.

The foxes do not soil their houses badly except during the whelping season, but at this time the nests are apt to become quite foul. For this reason, and as soon as the pups are weaned and removed from the breeding corral, the nest houses are thoroughly cleansed and sprayed with a disinfectant. What we consider a good formula for this purpose is 1½ pounds of lime and one-fourth pound of carbolic acid to a gallon of water. Our nest houses are so arranged that they can be thoroughly ventilated, and it is well to open them up for a day or two after spraying, so as to allow the air to circulate freely. The foxes, of course, should be removed to other quarters while this is being done.

It is well also to spray the ground, fences, and outside of the houses occasionally in order to kill any germs that might be present. This is particularly necessary when the corrals have contained sick foxes, and in the spring of the year when the ground is thawing. In fact, it is a good plan to do this at least once a month during the summer months.

DISPOSITION OF FOXES.—To understand the dispositions of the foxes under his care is probably one of the most difficult problems a keeper has to meet, and at the same time one of the most essential considerations in breeding the animals in captivity. We hope, by making a desirable disposition one of the chief points to be attained in our breeding operations, to secure eventually this much-needed feature. In order to accomplish this, however, a great amount of patience will be required, together with intelligent observation of the various characteristics exhibited and gentle treatment of the animals. Those animals which show vicious tendencies, together with their progeny, will very likely have to be eliminated entirely from the breeding stock.

Even with our short experience, we believe we have fully demonstrated that foxes, and particularly the blacks, if properly handled, can soon be brought to a stage of domestication that will greatly simplify their propagation in captivity. With a few exceptions all our animals were captured from the wild, and probably 50 per cent of these were mature foxes, used to the habits of wild animals, and therefore less tractable than the young ones; but, regardless of this fact, most of them are so tame that they will take food from the keeper's hand, and in some instances they will permit being handled. Our keeper makes a strong point of getting the foxes as tame as possible, and he is always careful when going about the corrals to do nothing that will frighten or excite them. Invariably he has some morsel of food in his pocket when going among the foxes, such as dried salmon, to offer to those that show signs of friendliness, and in this way he seems to have gained their confidence to a large extent. Perfection in this direction probably can not be attained with the animals now on the ranch, but by following our present tactics we believe we can eventually produce a thoroughly domesticated fox, and one lacking many of the objectionable features of the wild animals.

Cannibalism seems to be the common trait that offers the most serious obstacle, but no doubt this can be largely overcome in time. However, even thoroughly domesticated animals, such as cats and dogs, often show this tendency, so probably the safest plan would be to kill off foxes so inclined.

We have had three instances of cannibalism among our blue foxes, but thus far have experienced no difficulty with the blacks or crosses. One of our female blues has killed and partly devoured two mates; and in another case the male killed and ate the female. Regarding the latter instance, the pair had been corralled together before coming into our possession for three years, and during that time the female had killed two entire litters of pups when they were 2 months old. We know that this female was carelessly handled at a critical time, and that strangers were permitted to approach the nest when the pups were small, so that fact may account for her having turned cannibal. But for the male to have attacked his mate, after the two had been together in captivity for so long a time, is a thing we are unable to account for. These foxes were all having the best of care and attention, each was getting its full ration of food regularly, and they were all apparently contented. The first intimation our keeper had that anything was wrong was when he found the carcasses in the corrals. It is needless to say that the animals that committed these depredations will soon have their skins on the fur stretcher.

A problem now facing us, and which might properly come under the head of "Disposition of foxes," is the difficulty experienced by ranchers in rearing blue foxes in captivity. While but few attempts have as yet been made in Alaska in this direction, still the experiences of all have been about the same, and to date we know of no instance where a blue fox has been successfully raised to maturity in captivity on any of the ranches in Alaska. We have information of at least four litters of blue pups having been born, but in each instance they were destroyed by the parents before reaching an age of over 2 months. This must be attributable to some peculiarity in disposition that is probably not possessed by the black fox, and therefore is a problem that must be worked out by patience and careful observation.

The experience of some of the Canadian fox ranchers who exported blue foxes from Alaska two or three years ago has also been unsatisfactory, although it is reported that some have been successful in rearing a few pups, and one rancher reports having raised an entire litter of 12. We have also been told that the National Zoological Park, in Washington, succeeded in rearing at least two litters of blue-fox pups from parents taken from the Pribilof Islands. If this is a fact, some valuable information might be gained on the subject by an investigation of the manner in which the animals were handled.

Aside from the difficulty experienced in rearing the pups, the animals seem to be disinclined to breed when in captivity. In the wild state, or when they are at liberty on island ranches, the blues are more prolific breeders than the blacks, but when confined they are certainly less inclined to increase than are the blacks. There must be some logical reason for this, and it is hoped that investigation will soon offer some solution to the problem.

Since it has been proved that blue foxes will, even occasionally, breed and have young in captivity, then it seems unreasonable to believe that at least a few of such pups can not be raised to maturity. Time may show that only a small percentage of the blue foxes taken from islands, where they have had their liberty, will ever breed when placed in confinement; but even so, we believe that by carefully propagating the few pups that might result from breeding these animals, and by eliminating from the breeding stock all barren foxes and those that might have a tendency to destroy their young, a good and prolific breeding stock can eventually be built up. All the experiments in this line that have come to our notice have been conducted under most unfavorable conditions, so the results of these trials really can not be accepted as a criterion as to the future possibilities in this business.

We believe that the Government might well afford to investigate this subject and conduct experiments in breeding blue foxes in captivity. The Pribilof Islands, it seems to us, offer an excellent opportunity for this work, for an organization is now maintained there that could conduct such experiments along scientific lines. Furthermore, blue foxes are probably more numerous on these islands than any other place in the world, so breeding stock could be selected from a large number of animals.

Such experiments would prove of inestimable value to those engaged in the propagation of blue foxes, and if successful, as we firmly believe they would be, an important step will have been made toward the establishment of a remunerative industry in Alaska. Even a small percentage of the money accruing from the sale of fox pelts taken off the Pribilof Islands would go a long way toward furnishing the necessary funds for a proper and thorough investigation of this subject. As for ourselves, we are more than willing to inform those who are interested exactly what methods we have pursued in our attempts at breeding blue foxes, and we invite an inspection of our ranch by any who might desire to investigate our methods.

STOCK OF THE KODIAK FOX FARM.—In starting the ranch of the Kodiak Fox Farm it was the plan to devote most of our attention to the propagation of blue foxes, for we did not then believe it would be possible to secure enough black foxes from the wild to stock a ranch of the size we had decided upon. However, through circumstances, our plan has been considerably altered in this respect, and the foxes we now have in captivity consist mostly of blacks.

On August 24, 1914, we received at Kodiak 11 pairs of blue foxes, old and young, from the Semidi Propagating Co.'s ranch on Ukamok Island. Our corrals were not built at this time, and we were not ready to take the foxes to Long Island, so they were kept in a warehouse at Kodiak until December 18, almost four months. Desiring, however, to experiment with a few blacks and crosses, we notified the native hunters who left Kodiak on the opening of the fur season that we would pay better than fur prices for any good live animals they might bring in. The result was that we secured, in addition to our blues, 5 cross foxes and 3 blacks. Since we had accommodations for but 12 pairs of foxes, and owing to the fact that it was too late in the season to attempt to build more corrals, we turned loose on the island all but 8 pairs of the blues. We therefore retained in the corrals the following stock during the winter of 1914–15: 8 pairs blue foxes, 1 pair black foxes, 1 pair black female and cross male, 2 pairs cross foxes.

The blacks and crosses were brought to us, one at a time, from December to the middle of February of this year, and this fact made it necessary to disturb the foxes, more or less, until the breeding season was almost at hand. On this account, and also for the reason that many of the animals were 1914 pups, we did not figure on much of an increase. In fact, when no pups had been born by June 1 of this year [1915] we had about given up hopes of securing any.

On June 6, however, the female black with the black mate whelped. She had three black pups, one female and two males, and these have now been reared to maturity. On June 12 two pups, one red female and one black female, were born to the pair of cross foxes, and both of these have also been raised. Since both of these mothers were but 1 year old when their pups were born, we believe we can safely depend on getting larger litters from both another season.

Our stock of blue foxes has been considerably increased this year by the following purchases:

From Chas. Pajoman, Afognak, we purchased six pairs. These originally came from Dry Island, Abrams Island, Alfs Island, and Hog Island. From Ingwald Loe's ranch, on Raspberry Island, we secured three pairs, originally from Dry Island. We have also purchased two pairs from the Semidi Propagating Co.'s North Semidi Island ranch. All the above, except those from the Semidi Propagating Co., had been in corrals from one to three years; but the owners, Messrs. Loe and Pajoman, had become discouraged through failure in their efforts to raise blue foxes in captivity, so disposed of their entire stocks of this variety.

We have also purchased a number of black and cross foxes from the wild this season, and three black pups, born in captivity last spring, were secured from Carlson & Smith, Uyak. Our stock now consists of the following:

In corrals.—Twelve pairs black foxes (in two of the corrals containing black foxes we have put a female cross as an experiment to see if the males show any tendencies to mate with more than one female); six pairs blue foxes; and one pair consisting of a cross male and a red female. (In respect to the last pair the female was born in captivity and the male was taken from the wild. Both were particularly tame and were mated as an experiment along the lines of breeding for disposition.)

At large on the island.—Fifteen pairs blue foxes, together with whatever increase occurred last spring.

The uncertainty of results likely to be attained from attempts to raise blue foxes in captivity has prompted us to turn so many loose on the island, retaining only a sufficient number of selected animals in corrals for experimental purposes. We know from past experience of the Semidi Propagating Co. that the foxes will thrive when at large, and then the expense that would be required for constructing inclosures to accommodate them is obviated. Should our experiments prove satisfactory, however, we will naturally increase our stock of this variety and provide additional corrals.

LEGISLATION.—Legislation covering the fur industry in Alaska is sadly lacking, and it is hoped that laws will soon be passed that will remedy the present conditions.

The law now in force, the act approved April 21, 1910, being "An act to protect the seal fisheries of Alaska, and for other purposes," together with the various regulations promulgated by virtue of this law, has had a beneficial effect; but with changed conditions, demanding the hunting of fur-bearing animals for breeding purposes, legislation should be enacted to extend the authority now given the Secretary of Commerce. The act referred to grants permission to the Secretary of Commerce to promulgate certain regulations, but in order to protect this industry fully, a law should be passed giving him power to regulate every phase of it, and especially as regards the taking and shipping of live animals for breeding purposes. We think the following points should be carefully considered when enacting new laws or regulations governing the fur industry in Alaska:

Season for killing.—We believe in a number of instances the open season provided in Department Circular No. 246, May 24, 1915, covers too long a period. No doubt districts should be established, according to their varied climatic conditions, but this should be done only after careful and intelligent field observations and an actual study of the condition of furs taken during the various months. Our recommendation for an open season for foxes in this section, including Kodiak Island and all territory that lies south of it, and also possibly the Alaska Peninsula, is from December 1 to February 1, a period of two months. Fox skins in this section positively are not at their prime before December 1, and if the open season extends beyond February 1 the hunting of foxes will most likely interfere with the breeding season. Furthermore, the fur has already commenced to decline by the latter date, and for this reason alone the animals should not be hunted later.

Trapping for breeding purposes.—The trapping of wild fur-bearing animals for breeding purposes should be permitted in order that fur farms may be stocked, but this practice should be regulated by the strictest measures. Undoubtedly this privilege has been grossly abused, and we see in it, unless properly regulated, a means whereby the wild foxes, particularly of Kodiak Island, are likely soon to be exterminated. The method of trapping has also been anything but humane, and this is an important matter that should be given due consideration. In the promulgation of regulations governing the taking of wild fur-bearing animals for breeding purposes we think the following points should be considered:

Season for trapping breeding stock.—The trapping of foxes for breeding purposes might safely be permitted from August 1 to December 1, and, of course, throughout the open season. If trappers are permitted to take foxes earlier than August 1, however, there is going to be a great temptation to dig the pups from the burrows, and this is a thing that should be absolutely prohibited. As a rule the foxes here whelp during the month of May, but as we know from experience, this might be as late as the 12th of June. The pups are usually about 2 months old before they leave the burrows, so the reason for preventing trapping before August 1 is obvious.

Method of trapping breeding stock.—Our experience this year in purchasing foxes which had been caught in steel traps convinces us that this means of capturing animals for breeding purposes should be strictly prohibited. In almost every instance the foxes brought to us have been so badly injured by broken legs and lacerated flesh that a surgical operation has been necessary. In several instances the animals had been in the traps so long—owing, no doubt, to the fact that the trapper had neglected to go over his trap line for a number of days at a time—that the flesh of the injured legs had commenced to decompose before we could have the opportunity of giving them proper attention. Aside from the cruelty in this practice, the vitality of an animal that has undergone such suffering must have become greatly impaired, a thing that should be avoided when the fox is to be depended upon for breeding purposes. A person who constantly handles these animals soon becomes as attached to them as he would to a pet dog; they show many signs of affection when kindly treated, and such cruelty as has been exhibited to us naturally becomes repulsive.

Again, we are firmly of the belief that trapping for live foxes with steel traps is most destructive to the species at large. While we have no positive evidence, we are reasonably sure that many of the foxes caught in this manner during the past season have died, or have been so maimed that they will ultimately die of their injuries. In making it known that we were in the market for foxes for stocking our ranch, we agreed to take only blacks; so this is the only variety, with the exception of a few crosses, that was brought to us. Surely many reds and crosses must have been caught, and if we can judge their condition when liberated by that of the foxes we bought, they must have been in a sorry plight indeed. One native hunter who brought us a single black fox told us that he had trapped no less than 24 reds and crosses during the month of August, but had liberated them all; but from another native we learned that at least 6 of these foxes were dead when found in the traps, and that others were badly crippled when turned loose. Judging from the percentage of black, red, and cross fox skins usually collected at Kodiak, and taking into consideration the number of live black foxes brought to us this year, we think we are safe in saying that at least 100 red and cross foxes were either killed or maimed by reason of the trapping operations since the close of the last fur season. Our recommendation is that regulations on this point should be very strict, and we beg to offer the following suggestions:

1. Any regulation governing the method of trapping wild foxes for breeding purposes should provide that no steel spring traps be used. We have repeatedly advised the trappers that the jaws of their steel traps should be wrapped with cloth to prevent so much injury, but to no avail; so we recommend that the use of steel traps in this connection be absolutely abolished. A regulation covering this point should provide that only humane methods be used, and no traps that might kill or injure the animals should be permitted except during the open fur season. We think that some kind of a box trap, made either of wood or metal—such as is used, for instance, by many of the blue-fox ranchers for capturing foxes liberated on islands—could be effectively contrived so as to answer all purposes. It is probably true that fewer foxes would be caught in this manner than with the use of steel traps, still the animals would be in far better condition, and for that reason of more value. Then, again, during the season recommended for the trapping of live foxes there are a great many young animals not so cunning as the mature ones, and these could most likely be caught as easily by one method as another.

2. Persons should not be permitted to trap for live foxes during the period from August 1 to December 1 without first securing a license. In order to facilitate the

process of securing such license, an arrangement might be made whereby same could be issued by a deputy marshal, United States commissioner, or even a postmaster in districts that are remote or where there is no fur warden or other representative of the Department of Commerce. Such licenses should be numbered and should be issued for a given number of traps. It is also suggested, in order that a fur warden in the field might recognize or identify traps found, to have all traps tagged. It should further be provided that any person receiving such license must make returns, showing the number and variety of animals caught, where and to whom disposed of; also, that persons purchasing live foxes caught in the wild must make returns stating from whom purchased and the number of the license under which caught.

3. If the fox ranchers, the trappers, and fur dealers of Alaska are to be fully protected, then the exportation of breeding stock taken from the wild must be stopped, especially to foreign countries. Only ranch-bred stock should be allowed to leave the Territory and then only under permits issued to legitimate fox ranchers. The privilege granted to certain parties in the past to ship wild foxes from Alaska has been greatly abused, we think, and to the detriment of the fur business in the Territory. Many of the foxes shipped out have been bought by Canadian speculators, who have paid comparatively low prices, but who have used the animals to further the interests of some of the companies that have been organized for excessive amounts. This traffic has been greatly remunerative to the Canadian fox-ranching interests; but very little benefit has been derived for Alaska and, as a matter of fact, the furs produced in Canada from this stock come into direct competition with Alaskan furs. We are firmly of the belief that, if the fur business of Alaska is to be fostered, the exportation of breeding stock should be so regulated as to discourage it to a large extent.

Another matter of vital importance to the fox ranchers of Alaska is the lack of laws that will permit those engaged in the business to acquire title to the islands along the coast that are suited to the business. This lack, we believe, will greatly retard large-scale ventures, for people will be unwilling to invest the amounts necessary to make fox ranching an important industry unless they have assurance that their titles will be secure. The system of leasing the islands for a short term of years is entirely inadequate. It has already been shown that a considerable amount of capital is required to establish a ranch, and this fact is going to make it necessary to raise money through incorporation where the business is undertaken on a large scale. Without full protection as to property rights, however, it will not be possible to get capital to invest.

OTHER FOX FARMS IN KODIAK-AFOGNAK REGION.

The following information in regard to various fox-farming operations has been furnished the office:

Carlson & Smith, of Uyak, have a ranch at Uyak Bay, Kodiak Island. In 1914 three corrals were built. The stock consists of black and cross foxes.

Peter J. Petrovsky, of Uyak, has a ranch on Amok Island, Uyak Bay. In 1914 eight pairs of cross foxes, caught in the winter of 1913–14, were liberated on this island. There are also two pairs of black foxes in corrals on this ranch, caught from wild stock in 1914.

Alex Friedolin, of Afognak, has a blue-fox ranch on Hog Island, a small wooded island near Afognak. The foxes are permitted to run at large. This island was stocked with cross foxes by Johansen & Christensen in 1897, and a few years later some black foxes were introduced. Shortly afterwards all the foxes on the island disappeared. The island was again stocked by Johansen & Christensen, this time with blue foxes, and in 1904 Mr. Friedolin became the owner.

Charles Peterson and Charles Eckstrom stocked Dry Island, situated between Kodiak and Afognak Islands, with black foxes in 1894. About the year 1904, after a long period of experimenting with black foxes with but indifferent success, all the animals were killed off and the island restocked with blue foxes. Since the introduction of blue foxes considerable success has been attained, owing, most likely, to the exceptional care and attention given the business. The foxes have been allowed to run at large on the island, but have become very tame, and in several instances litters have been found under the ranch buildings. The quality of the fur produced has been above the average. A large stock of dried salmon has been prepared each summer, to be used for winter feeding, and fresh fish such as cod, halibut, etc., have been fed whenever obtainable. In the early part of 1915 Charles Eckstrom's interests were transferred to Charles Pajoman.

Ingwald Loe, of Afognak, established a fox ranch on Raspberry Island in 1911. It is understood that the work was limited in character, and in 1915 the entire stock was sold to the Kodiak Fox Farm. It is said that Mr. Loe proposes to stock his ranch with black foxes in the near future.

Charles Pajoman, of Afognak, stocked a ranch on Raspberry Island, near the Loe ranch, in 1912. Twelve corrals were built and four pairs of blue foxes were introduced the first year. The stock of blue foxes was increased later and a few black foxes were also added. Little or no success was had with the blue foxes, and in 1915 the stock was sold to the Kodiak Fox Farm. It is understood that Mr. Pajoman proposes to continue work with the black foxes and to move his corrals for breeding these animals to Dry Island.

Frank Lowell, of Kodiak, stocked Ugaiushak Island with three female and two male blue foxes from North Semidi Island in 1915. It is understood that the foxes were liberated but that an attempt will be made to breed them in corrals.

John Tashwak, a native of Afognak, captured in 1914–15 a number of foxes which he liberated on a small island in Marmot Bay, near Afognak. He reports having a stock of 4 red, 9 cross, and 4 silver-gray foxes. No young were born in 1915.

I. P. Chichenoff, of Kodiak, purchased a pair of foxes, one red and one cross, about January 1, 1915, and liberated them on a small island about 2 miles from Kodiak. The island is bare and contains only a few acres. The only fresh-water supply is from rain which accumulates among the rocks.

M. D. Snodgrass, of Kodiak, recently liberated on Kalsin Island, about 12 miles from Kodiak, a number of cross foxes. This island was formerly occupied as a blue-fox ranch.

Frank Peterson, Uyak, has a fox ranch on a small island near the mouth of Red River. In 1911 Mr. Peterson turned loose one pair of black foxes on the island. It is said that he has had a good increase and that several animals have been sold for breeding stock. In one instance he sold a pair of pups for about $600.

August Olson, Kodiak, has a fox ranch on Ugak Island, near the entrance to Ugak Bay, Kodiak Island. This island was first stocked by Oliver Smith in 1891. Black foxes were first placed on the island, and about 3 years later a few pairs of blue foxes were added. As appears to be always the case when black and blue foxes are placed together, the blue foxes were soon exterminated. O. B. Anderson came into possession of this island about 1901, and he operated it until 1912, when his interest was transferred to Mr. Olson. During the period that Mr. Anderson owned the ranch there were probably 100 black fox skins taken, and as a rule the quality of fur produced was above the average.

Abraham Gregorioff, Uzinki, Kodiak post office, about 10 years ago stocked a small wooded island, known locally as Abrams Island, near the northern end of Spruce Island, with a few blue foxes. Owing to the rocky shore line of the island the natural supply of food is limited and the ranch has not been very productive. In 1898 Gregorioff also stocked Noonjak Island, another small island near Spruce Island. The original stock consisted of one pair of blue foxes, and probably a total of 40 in skins and live animals have been taken.

Albert Johnson, Uyak, stocked a ranch on Amook Island in 1912 with 6 pairs of blue foxes, all of which were placed in corrals. About April 15, 1914, having had no increase from the foxes after two seasons, Mr. Johnson abandoned the Amook Island ranch and liberated all his foxes on Harvester Island, at the entrance to Uyak Bay. Three weeks after this one of the females gave birth to a litter of young.

In 1915 three natives of Uzinki put some stock on small islands adjacent to Spruce Island, as follows:

Nick Michael placed 4 black foxes on a small island near Nelsons Island.

John Katelnikoff placed 2 black and 4 cross foxes on a small island known as Low Island.

Fred Squartsoff placed 1 pair of cross foxes on a small unnamed island near Uzinki.

EARLY FOX FARMING IN THIS REGION.

The following account of earlier fox-farming operations in the Kodiak-Afognak region, included in Mr. Erskine's report of the Kodiak Fox Farm, is of so much interest that its publication seems desirable.

Remarks under this head will refer to a history of fox farming in the vicinity of Kodiak and Afognak Islands. Information has been gathered from those old-time residents in this section who have had to do with the fox ranches, and reference has been made to the chapter touching this subject as contained in Bureau of Fisheries document no. 797. While we believe the following information is fairly correct, especially as regards essential points, still we must reserve the right to rectify any inaccuracies that might occur. Consideration must be given the fact that the Semidi Propagating Co. was probably the only concern that kept any kind of record regarding fox-breeding operations, so we are of necessity forced to rely to a large extent upon the memories of those now residing in Kodiak and who are familiar with the subject.

The earliest reliable record we have of fox farming in this vicinity was on Long Island, the island now occupied by the Kodiak Fox Farm. This island was first taken up by Capt. F. F. Feeney in 1880, and two pairs of black foxes were placed on it, the animals having been secured from Knik, Cook Inlet. A few sheep and some cattle were also introduced; a dwelling and several outbuildings were constructed, and farming in the way of raising garden truck and hay was done. During the winter of 1881–82 the natives raided the island and killed off all the foxes, some 12 or 14, and no further attempt was made to raise foxes for some years. The island was still maintained, however, as a stock ranch. In 1889 Capt. Feeney secured two pairs of Kodiak black foxes with which he again stocked Long Island, and in 1895 he sold the ranch, together with all stock, to the Semidi Propagating Co. for the sum of $8,000. The stock at this time consisted of 8 black foxes, 45 head of cattle, and a number of sheep. The number of fox skins produced from 1889 until the island was sold is not known, but there could not have been many. The native hunters were inclined to poach on the ranch and their raids kept the stock of foxes down to a minimum. The operations on Long Island under the management of the Semidi Propagating Co. will be taken up elsewhere in this report.

Fox farming to a limited extent was probably carried on by the Russians before the American occupation, although reliable information on this matter is lacking. We doubt if any intensive efforts were exerted along these lines; but it is possible some black foxes were introduced from the Cook Inlet country and liberated on a few of the islands in the vicinity of Kodiak. Reports to this effect are current, but if such was the case, the animals were most likely killed off many years ago, and probably before the Americans took possession of the Territory.

Semidi Propagating Co.—The Semidi Propagating Co., a corporation, was the first large concern to undertake the raising of foxes in Alaska. Aside from their operations in Alaska, this concern purchased an island on the Maine coast and stocked it with blue foxes. This venture, however, was not a success. Their chief efforts were exerted in Alaska, and at different times they stocked North Semidi, South Semidi, Ukamok (Cherikoff), Long, Whale, and Marmot Islands. We will take up the operations on each of these islands as follows:

North Semidi Island.—This was the first attempt on the part of the Semidi Propagating Co. to stock a fox ranch, and in 1885 some 8 or 10 pairs of blue foxes were liberated on this island. Additional stock was placed on the island on several different occasions, and in a very few years this ranch proved quite productive. In 1907 the stock had become so reduced that no killing was done by the company for several years, although during that period probably 50 skins were taken by poachers. It is also believed that poison was used by the trespassers, for evidence of this was found when the island was visited last year. In 1914–15, 35 animals were taken, 26 skins, and 9 live foxes for breeding purposes.

SOUTH SEMIDI ISLAND.—About 1886 or 1887 this island was first stocked. Three or four pairs of blue foxes from North Semidi were introduced, and one black male fox was also liberated as an experiment to ascertain if these two species would cross. Within a few months, however, the black fox had exterminated all the blues on the island, so this animal was finally hunted down and killed. South Semidi was again stocked about the year 1891 with about 18 pairs of blue foxes. Most of these came from North Semidi, but we believe a few were also brought from one of the Pribilof Islands. The original lot of foxes put on North Semidi came from the Pribilofs, and we believe the company made several shipments of blue foxes from these islands to furnish stock for their ranches. About 1896 black foxes again caused havoc among the blues. The previous year a small island adjacent to South Semidi was stocked with a few black foxes taken from Long Island. These animals soon found a way to cross the narrow strip of water separating the two islands, and they immediately started their depredations on the foxes of South Semidi. This was discovered, however, before a great deal of damage had been done, the black foxes were all hunted down and killed, and the island eventually became a large producer of blue-fox skins.

UKAMOK (CHERIKOFF) ISLAND.—This island was first stocked about 1891, when 6 or 8 pairs of blue foxes from North Semidi were liberated here. Other stock was added on several occasions, and probably some blue foxes were brought from the Pribilof Islands. Ukamok eventually became the largest producer of blue-fox skins of any of the islands stocked by the Semidi Propagating Co. This island is 15 miles long by about 3 miles wide, and is so situated as regards ocean currents that a large quantity of drift is deposited upon the beaches, thus insuring an ample supply of sea food. From 1902 to 1913, both years inclusive, 866 blue-fox skins were taken from this island. Probably no less than 100 pairs of breeding animals were sold during that period, and in 1914, 11 pairs of live foxes were taken to stock the ranch of the Kodiak Fox Farm. This makes a total of 1,088 foxes taken during the 13 years accounted for, or an average of 83 per year. Under present market conditions for blue-fox skins the results of catches from this island would have shown a handsome profit to the owners; but it so happened, during the years when the large catches of foxes were made, that the prices were particularly low. For instance, in 1903, when 149 blue-fox skins were taken from Ukamok, the average net price realized was only $8.70 per skin. Under present conditions these should have netted the Semidi Propagating Co. no less than $8,000, instead of the small sum of $1,296.30.

LONG ISLAND.—This island was purchased from F. F. Feeney, as previously stated, and the foxes on it at the time the Semidi Propagating Co. acquired title, 8 black foxes, were put on a small island near South Semidi. (See remarks under South Semidi.) Shortly after its purchase, Long Island was stocked with blue foxes, about 30 pairs having been taken off North Semidi for this purpose. Long Island became very productive, and the quality of the fur was probably superior to that secured from any of the other islands belonging to the Semidi Propagating Co. The largest number of foxes killed during a single season from any of the islands was on Long Island in 1903, when 209 blue-fox skins were taken. This was the year, however, when prices were exceptionally low for all kinds of fur, so the result of the sale of these skins was quite a disappointment to those interested.

WHALE ISLAND.—This island was stocked about 1899 with blue foxes from Long Island. The largest catch ever made on this island in a single season was in 1908, when 45 skins were taken. This is a large island, and its natural conditions should have made it an excellent one for raising foxes. Unfortunately, however, Whale Island is situated too close to a large native village, and is too large for one man to watch.

Undoubtedly this island was constantly raided, and this fact probably accounts for the small production of fur. The last time the company secured any skins from Whale Island was about three years ago, when two hunters were sent from Kodiak with instructions to shoot or trap all the foxes possible. At this time only 3 pelts were obtained, but the hunters reported finding no less than 13 carcasses of young foxes in steel traps. The company did not use steel traps, so those discovered must have been set by poachers. Also, the fact that the traps were put out in a season when young foxes would be caught is conclusive evidence that an attempt was being made to secure live animals for breeding stock, for the furs taken at this time of year would have been worthless.

Marmot Island.—We have no information that blue foxes were ever placed on this island; but at some time during the period of operations of the Semidi Propagating Co. black foxes were introduced. The venture, however, was not a success, and Marmot Island was abandoned by the company some years ago.

While the Semidi Propagating Co. has been an important factor in the development of fur farming in Alaska, to the extent that their experience has been of value to others who have attempted this business, still their operations from the standpoint of an investor have not been a success. Little was known of the best methods to follow when this company first undertook the raising of foxes, and naturally many mistakes were made. The prices of blue-fox skins during the years of their greatest production were but a small fraction of their present values, so returns, even in the best seasons, were small. Operating costs were also very high; much expensive food, such as corn meal, was fed, and several of the islands being situated so far from the base of supplies made the cost of transportation quite excessive. The only islands upon which the company now have foxes are Ukamok, North Semidi, and South Semidi, and the numbers have been so reduced on these that it will be several years before any quantity of furs can be taken.

Of a number of cattle which the Semidi Propagating Co. introduced on several of their islands, some are still to be found on Whale and Ukamok Islands.

Following we give a list, by years, of the blue-fox skins produced by the various islands operated by this company from 1890 to 1914, both years inclusive. We are unable to give the figures from each ranch separately, but the list includes all fox skins taken from the islands mentioned above, with the exception, of course, of Marmot Island:

	Number.		Number.		Number.
1890	73	1900	300	1909	145
1891	60	1901	373	1910	15
1892	92	1902	357	1911	None.
1893	119	1903	714	1912	3
1894	115	1904	401	1913	85
1895	158	1905	441	1914	73 [a] 31
1896	166	1906	261		
1897	165	1907	310		
1898	327	1908	74	Total	5,101
1899	243				

[a] Live foxes.

In addition to the above there were at least 200 pairs of live foxes sold for breeding stock, so the total number of animals taken from these islands is not less than 5,501.

FOX FARMS IN THE COPPER RIVER DISTRICT.

The Bureau has obtained a record of a considerable number of persons who are interested in the fox business in this region. It is apparent that in many cases the operations are carried on not primarily for the purpose of breeding and rearing foxes but rather for the purpose of trafficking in foxes.

Among those who are really interested in the breeding and rearing of foxes are the following:

1. The Alaska Fur & Silver Fox Co., with headquarters at Seattle, Wash., has operated a fox farm at Dry Creek since June, 1910. Notwithstanding the fact that the company had men in charge of their farm who were well qualified to handle stock and were interested in their work, but little success attended their efforts to breed foxes in 1915, only one litter of pups being raised. It is reported that the company intends to start another farm near South Bend, Wash.
2. C. L. Hoyt, of Gulkana, has a fox farm at that place. While Mr. Hoyt has studied the matter seriously and has endeavored to employ improved methods in his operations, the results obtained have been far from successful. It is estimated that he has spent approximately $10,000 in building suitable corrals.
3. Mrs. Nellie Yager has started a fox farm at Sourdough. Three wire pens, 25 feet by 25 feet by 10 feet, with covered wire tops, were built in October, 1915. Her start is being made with two pairs of silver foxes obtained by purchase.

It is understood that the Copper River Valley produces excellent furs and that the section is a favorite one among fur buyers.

FOX FARMS ON THE TANANA RIVER.

Fox farming is practiced to some extent along the Tanana River. The operations of George L. Morrison, Hot Springs; Sam Brown, Hot Springs; and the Vachon farm, Tolovana, are noted. Mr. Morrison has gone into the business on a comparatively large scale and has attained a considerable degree of success in the matter of breeding. He has probably one of the best equipped farms in Alaska and his investment is large. The Brown farm appears to have been, from the report received, of a rather improvised character. Details in regard to the Vachon farm are not at hand.

FOX FARMS ON THE YUKON RIVER.

A number of operators were reported from along the Yukon, including George Rouse and Fred Stock, Tanana; Alfred's farm, E. B. Clark, and Williams & Brown, at Ruby; D. W. Lewis, Yukokakat; A. Noller and A. J. Stockman, Louden; J. W. Evans, Koyukuk; Los Feger, Nulato; Shepherd & Edwards, Old Hamilton.

Roy L. King and Ernest King have a fox farm on the Koyukuk River, a tributary of the Yukon, at a point 20 miles above Bettles. Their farm has been located there since 1914, and in April, 1916, the stock consisted 11 cross foxes and 5 silver foxes.

At Rampart there is a fox farm which was established in 1913. This farm is owned by Clem Anderson, and the results which he obtained from a very medium grade of foxes are worth noting. In the year 1914 a pair of cross foxes produced a litter of 3 crosses, 1 silver, and 2 reds. From the same pair in 1915 he obtained 5 crosses and 3 reds. Another pair of crosses in their first litter in 1915 produced 5 crosses and 1 black. Also in 1915 he obtained from a pair of red foxes a litter of 6 red foxes and 1 silver. His foxes are very tame and he feeds them on a diet of fish and rabbits. His farm is located on a high, dry bank of the Yukon and has cost him about $5,000.

MISCELLANEOUS FUR FARMING.

Fox farming is carried on to some extent on the islands westward of the Kodiak-Afognak group, though the Bureau does not have complete information in regard to individual operations. The Department of Agriculture has jurisdiction over matters pertaining to the propagation of fur-bearing animals within the Aleutian Islands Reservation and is endeavoring to assist the natives in work of this kind.

Andrew Grosvold, of Sand Point, Alaska, has been interested in blue foxes for a number of years. He states that he has placed foxes on Caton, Sarana, and Omla Islands, of the Sannak group; Chernabura and Big Goose Islands, of the Sandman Reefs; and Andronica, Bird, and Chernabura Islands, of the Shumagin group. Mr. Grosvold also has a lease from the Department of Commerce for the use of Little Koniuji Island, Shumagin group, for fur-farming purposes. J. C. Smith, of Sand Point, Alaska, has a similar lease for Simeonof Island. It is understood that 10 pairs of blue foxes were placed on Simeonof Island in 1895; that no trapping was done until in 1901, when 50 skins were taken, 125 in 1902, 80 in 1903, 34 in 1904, 62 in 1906, 46 in 1908, 34 in 1910, 14 in 1911, 10 in 1912, and 12 in 1914.

Joseph Voelkl and Ben Waiczunas, Eighteen Mile Post, Haines, reported having a stock of 1 black, 16 cross, and 2 red foxes, and 9 minks.

Thomas Steffensen and Wm. V. Perry, of Eureka, reported a stock of 4 foxes and 11 minks.

John Fanning, of Wrangell, reported a stock of 3 martens and 3 minks.

L. G. Michael, of Franklin, had in his possession a number of foxes in 1915. One litter was born in that year.

Alex. A. Seaholm, of Hot Springs, reported a stock of 6 cross foxes and 4 martens.

Isaac Fisher, of Anvik, reported a stock of 6 foxes.

CONDITIONS IN THE BRISTOL BAY REGION.

Observations made by Warden Brown, who was stationed in the Bristol Bay region during the winter of 1915–16, and reported by him in February, 1916, gives considerable information in regard to conditions there.

Fur generally was as fine as trappers have taken in years, its high quality being due likely to the long-continued steady cold of the winter.

It was estimated that the region would produce this season as compared with the preceding season three times as many fox skins. Fox pelts were the only ones which showed an increase in price at the trading stations. The preceding winter traders paid from $3.50 to $5 per skin; this winter from $6 to $10, payment being made in trade.

Not many mink, land otter, ermine, or lynx were being caught, owing largely to the low prices for these pelts. Mink and lynx were scarce, while ermine were plentiful in places. Few wolverine skins were being offered to traders.

Land-otter skins were bringing but $5 each, paid either in trade or cash. Two years before the same traders were paying $20 each for the pelts of these animals. Mink skins were bringing at traders' stores 75 cents to $1.25. Two years ago traders paid from $3 to $4.50 for mink skins. Muskrat skins were bringing but 10 cents each, but these skins do not begin entering the trading stations until the spring break-up. Ermine skins were bringing 50 cents each, about the usual price. Lynx skins were bringing but $5 each at trading stations. Two years before traders paid $22.50 for them.

Good wolverine skins were bringing from $12 to $14. The Eskimos use these skins generously in trimming their clothing, and the demand thus created prevents wolverine skins from leaving this region. Owing to a similar local demand for wolf skins, the pelts of these animals were bringing from $15 to $20 each. The wolf, however, has been practically exterminated in this region.

SHIPMENT OF FURS FROM ALASKA.

A regulation of the department requires that all shipments of furs from Alaska shall be reported to the Bureau of Fisheries. The value of these reports lies chiefly in furnishing information as to the quantity of furs shipped from the Territory. The Bureau provides two forms for use by the shippers in making the reports. One form is for shipments made by mail, and each shipment of this character must be certified by the postmaster at the office from which it is made. The other form is for use in reporting shipments made otherwise than by mail, i. e., by freight, express, personal baggage, etc. A large portion of the furs shipped from Alaska is sent by mail.

The following table shows the number of pelts shipped from Alaska of the various kinds of fur-bearing animals in the years ending November 15, 1913, November 15, 1914, and November 15, 1915, respectively. The table does not show shipments made from the Pribilof Islands, information concerning which is given elsewhere in this report. The Bureau is under obligation to the collector of customs at Juneau for assistance in checking its statistics with the records of his office.

MINOR FURS SHIPPED FROM ALASKA IN 1913, 1914, AND 1915.[a]

Species.	Year ended Nov. 15, 1913.			Year ended Nov. 15, 1914.			Year ended Nov. 15, 1915.		
	Number of pelts.	Average value.	Total value.	Number of pelts.	Average value.[b]	Total. value.	Number of pelts.	Average value.	Total value.
Bear:									
Black	1,363	$12.57	$17,132.91	663	$12.57	$8,333.91	739	$7.50	$5,542.50
Brown	38	9.00	342.00	32	9.00	288.00	20	7.50	150.00
Glacier	111	22.50	2,497.50	3	22.50	67.50	3	50.00	150.00
Grizzly	12	40.00	480.00	....	....	....	20	20.00	400.00
Polar	72	40.00	2,880.00	104	40.00	4,160.00	....	....	....
Beaver	25	10.00	250.00	10	10.00	100.00	[c] 70	10.00	700.00
Ermine	6,559	.96	6,296.64	6,873	.96	6,598.08	3,538	.60	2,122.80
Fox:									
Black	24	253.00	6,072.00	13	253.00	3,289.00	8	400.00	3,200.00
Blue	892	46.59	41,558.28	239	46.59	11,135.01	382	50.00	19,100.00
Cross	768	14.24	10,936.32	1,380	14.24	19,651.20	1,360	12.00	16,320.00
Red	10,820	9.80	106,036.00	14,967	9.80	146,676.60	11,770	8.00	94,160.00
Silver gray	132	147.30	19,443.60	153	147.30	22,536.90	187	150.00	28,050.00
White	3,756	12.93	48,565.08	6,530	12.93	84,432.90	5,967	13.00	77,571.00
Hare, Arctic	49	.40	19.60	1,263	.40	505.20	51	.10	5.10
Lynx	4,772	12.35	58,934.20	6,930	12.35	85,585.50	9,374	8.00	74,992.00
Marten	9,682	7.56	73,195.92	6,497	7.56	49,117.32	3,028	6.00	18,168.00
Mink	47,062	4.46	209,896.52	35,623	4.46	158,878.58	23,073	2.00	46,146.00
Muskrat	163,616	.33	53,993.28	101,202	.33	33,396.66	32,933	.15	4,939.95
Otter:									
Land	1,300	10.70	13,910.00	1,008	10.70	10,785.60	980	8.00	7,840.00
Sea	....	....	....	1	200.00	200.00	....	....	....
Reindeer	5	1.00	5.00	....	....	....	....	....	....
Seal, hair	1,458	1.17	1,705.86	1,742	1.17	2,038.14	....	....	....
Squirrel	34	.08	2.72	662	.08	52.96	167	.05	8.35
Wolf	163	7.00	1,141.00	44	7.00	308.00	51	4.00	204.00
Wolverine	242	11.44	2,768.48	136	11.44	1,555.84	119	7.00	833.00
Total	....	....	678,062.91	....	....	649,692.90	....	....	400,532.70

[a] Neither the fur-seal skins nor the fox skins from the Pribilof Islands are included.
[b] Assuming same average values as for year preceding.
[c] Confiscated pelts.

MISCELLANEOUS NOTES.

The following brief notes in regard to various fur bearers are deemed worthy of record:

Beaver.—Warden Townsend, with headquarters at Fairbanks, reported that from observations made by him in the summer of 1915 beavers were largely on the increase. Warden Gray, reporting on conditions in southeast Alaska, states that in no other year has the increase of these animals been so apparent.

Fisher.—Definite records that this animal occurs in Alaska are lacking, but a number have been taken just over the eastern boundary.

Land otter.—These animals are believed to be holding their o everywhere in southeast Alaska. Their habits are such that t trapping of them is attended with difficulty.

Lynx.—A large increase in the numbers of these animals is reporte from the interior of Alaska.

Marmot.—Warden Gray reports these animals abundant along th mainland in the region of Wrangell and suggests that some economi use might be found for their pelts.

Marten.—In connection with his fox farming, J. W. Evans, Koyukuk, has also experimented with martens, a pair of which were raise in captivity. It is reported that the pair are the offspring of captiv parents.

More of these animals were taken in the region about Wrangell in the winter of 1915–16 than usual, and trappers reported the signs of these animals to be more common than for several years previous.

Sea otter.—Very little information has reached the Bureau indicating that the sea otter has undergone any appreciable increase in numbers as the result of the present absolute suspension of legal killings. It is reported that two were seen near Forrester Island and one near Warren Island, southeast Alaska, in 1915.

LEASING OF ISLANDS.

No additional islands were leased by the department for the purpose of propagating foxes and other fur-bearing animals. The leases executed in 1914 remained in force, the islands under lease being as follows:

Island.	Lessee.
Carlson (Crafton)	Moose Bay Fur & Trading Co., Tacoma, Wash.
Middleton	Joseph Ibach, Valdez, Alaska, vice Tim Marcum.
Simeonof	J. C. Smith, Sand Point, Alaska.
Little Koniuji	A. Grosvold, Sand Point, Alaska.

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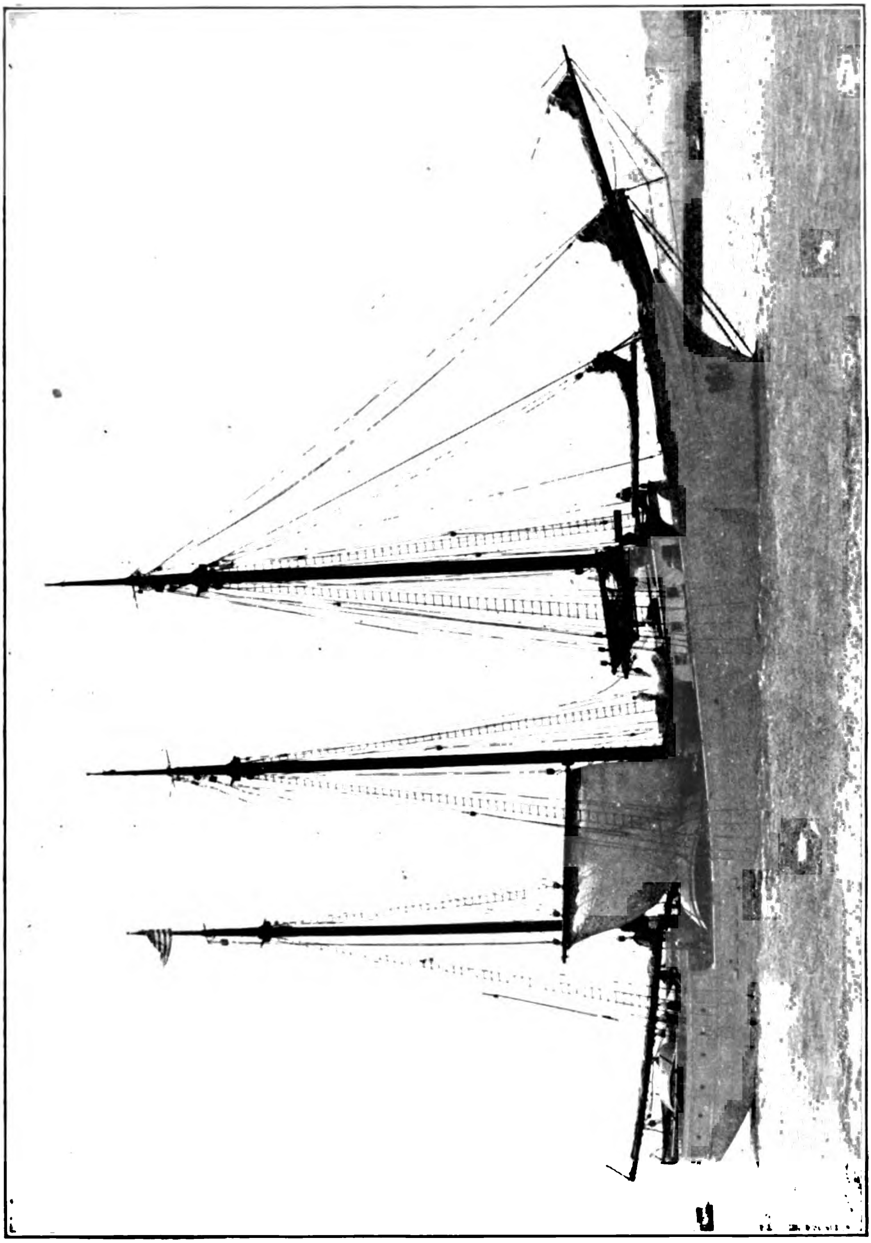

UNION FISH COMPANY'S TRANSPORTING POWER SCHOONER "GOLDEN STATE."

PACIFIC COD FISHERIES

By John N. Cobb

Appendix IV to the Report of the U S. Commissioner
of Fisheries for 1915

1

CONTENTS.

Page.

Natural history of the cod 5
  Distribution 6
  Size 7
  Migrations 8
  Spawning 9
  Young 9
  Food 9
  Other members of the Gadidæ 10
  Species miscalled cod 12
Banks frequented by cod 13
  Offshore banks in Bering Sea 14
  Offshore banks in the North Pacific Ocean 16
  Inshore banks 20
  Banks on the Asiatic shore 23
History of the Pacific codfishery 23
History of Alaska shore-fishing stations 37
Persons employed 41
Vessels and boats 42
  Lay of the crew 45
Season, methods, etc 48
Dressing the fish 56
  Shore-station methods 58
Wastage in the industry 62
Preparing cod for market 63
  Use of preservatives 71
  Market for Pacific cod 72
  Comparative analyses of Pacific and Atlantic cod 75
  Reddening of cod 75
  Brown mold 79
The industry in 1915 79
  Persons employed 79
  Investment 80
  Products 81
The fishing fleet in 1915 81
  The transporting fleet in 1915 82
Alaska shore stations operated in 1915 83
Summary of catch 84
Summary of vessel fishing data 84
Detailed data of the fishing fleet, 1863 to 1915 87
Summary of shore-station data 99
Detailed operations of transporting fleet, 1876 to 1915 100
Disasters to the fleet 107
Bibliography 108

PACIFIC COD FISHERIES.

By John N. Cobb.

NATURAL HISTORY OF THE COD.

Strange to relate, while the fishery for Pacific cod has been prosecuted since early in the sixties, scientists are not yet agreed as to the proper name for the species. According to Bean[a] "Most writers have referred to it under the name of *Gadus macrocephalus*, which was bestowed by Tilesius upon the Kamchatkan cod, the figure of which suggests that it was based upon a deformed individual. Cope, in 1873, described the young of the common Alaska cod as a new species, *Gadus auratus*, from specimens collected by Prof. George Davidson, of the United States Coast Survey, at Unalaska. Steindachner, in the Proceedings (Sitzungsberichte) of the Vienna Academy, LXI, 1, 1870, adopts the name *G. macrocephalus* for a large cod taken in De Castries Bay (mouth of Amur River), Siberia. In this example the length of the head is contained exactly three times in the total length to the extreme end of the pointed caudal peduncle. The same proportion may, however, be found in any place where large numbers of *Gadus morrhua* are taken, and it can readily be proven to be only a matter of individual variation."

In the summer of 1880, the late Prof. Spencer F. Baird, then United States Commissioner of Fish and Fisheries, sent Dr. Tarleton H. Bean to Alaska for the purpose of investigating its fish and fisheries, and he made the first extended report on the Pacific cod that had been made up to that time.[b] As a result of his investigations, he considers the Atlantic and Pacific cod as of the same species. Jordan and Evermann[c] call it *G. macrocephalus*, and in justification of this state: "In external respects we recognize no distinction between this species [referring to a specimen 20 inches long taken in the Strait of Juan de Fuca by the *Albatross*] and the common eastern codfish, except that the head seems larger." They also quote Dr. Gilbert[d] as follows: "It has been frequently pointed out, and is well known to fishermen, that the Pacific codfish has a smaller air bladder or sound than the Atlantic cod. Pending an examination of this question, which we are not now in a position to make, we propose to recognize the Pacific fish as a distinct species."

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[a] The Cod Fishery of Alaska, by Tarleton H. Bean. The Fisheries and Fishery Industries of the United States, pt. II, sec. 5, vol. I, p. 198, 199.

[b] Ibid., p. 198–226.

[c] The Fishes of North and Middle America, by D. S. Jordan and B. W. Evermann Bulletin, United States National Museum. no. 47, pt. III, p. 2541, 2542. (1898.)

[d] Ibid., p. 2542.

Much has been said and written of the difference in size between the sound of the Atlantic cod and that of the Pacific. A large part of this is hearsay, based largely on the statements of fishermen, few of whom have ever made any effort to save them. The writer cut out a few sounds in 1913, but, unfortunately, these were lost in some way during transportation; and, although it had been some years since he had cut a sound from an Atlantic cod, it seemed to him that the Pacific sounds were almost, if not quite, as large, but thinner. Some few years ago the Alaska Codfish Co. made an effort to save the sounds at one of its Alaska stations, but the men refused to do so except at an exorbitant price. A. Greenebaum, the president of the company, writes that the sounds are small in size.

The only authentic record the writer has of a direct comparison of Pacific and Atlantic sounds is in a letter from Dr. W. C. Kendall, assistant, United States Bureau of Fisheries, under date of January 22, 1915, in which he states:

> The air bladder of the big Pacific cod [the weight of this was about 30 pounds and its total length about 39 inches], after removal, measured about 13 inches in length, with no perceptible horns excepting slight projections, but it had a very large pouch on each side of the anterior end.
>
> The air bladder of the big Atlantic cod [of a weight of 34¼ pounds and a length of 43½ inches] was of the same length approximately, pouches small, but the horns, which could not be fully straightened out, measured each 10 inches in length. In natural position in the fish they are coiled up.
>
> The small Pacific cod [8 or (9?) pounds and 28⅜ inches long] was in such bad condition that the air bladder could not be removed intact, but the one horn that could be found was only 1 inch in length.
>
> The other Atlantic cod [weights and lengths about the same] had air bladders and horns as follows: Length 9¼, horns 2½ and 3; length 10½, horns 3¾ and 3¼; length 10 inches, horns 7 and 5½ inches.

It is to be hoped that some one will soon take up the study of the comparison of the sounds from the cod of both oceans, as should the Pacific sound prove to be uniformly smaller than those from the Atlantic cod it would furnish a distinguishing feature.

DISTRIBUTION.

The Pacific cod is occasionally found as far south as Cape Flattery on the Washington coast. From Puget Sound north to southeast Alaska they are said to be more common, although in no part of this region is a commercial fishery maintained for them. In southeast Alaska, in early years, a small fishery was maintained in and adjacent to Chatham Strait, but nothing has been done here of recent years. Cod in abundance are not to be found until the Portlock Bank is reached. From here to Akutan Pass cod are very abundant, and probably will be found in considerable abundance along the Aleutian Chain beyond the pass. In Bering Sea, between Unimak Pass and Bristol Bay, are to be found several large and important banks adjacent to Unimak Island and the Peninsula. They have been reported as far north as St. Lawrence Island in Bering Sea, but none have been reported in the Arctic Ocean. Edgar O. Campbell,[a] a school-teacher for the United States Bureau of Education, on St. Lawrence Island, in a letter dated September 21, 1909, has the following to say as to the presence of cod around the island:

> A few codfish feed here and are caught every year from July to October, but not in any appreciable numbers except every third to fifth year. This year promises to be a good one, although the Eskimos are so timid they will not go out for more than a half mile from shore in their skin canoes. Some years the fish stay until in November and great numbers of them are caught by the ice as the sea freezes over. How do you suppose this happens? I have supposed that, as the top of the sea coats over with a slushy soft ice, the cod, for some reason or other, it may be for air, jump up through the ice and fall on the surface, their weight not being sufficient to carry them below into water again. At any rate they soon freeze and, as soon as the ice is solid enough to walk on, the Eskimos bring them home in great piles, like cordwood. This has happened twice since we came in 1901. In such years the fox catch is sure to be light, for the fox are so well fed they are wary of prepared bait.
> * * *

On the Asiatic shore cod have been reported as far north as Cape Tchaplin, East Siberia, while they have been found as far south as Hakodate in Japan. They are most abundant in the Okhotsk Sea.

SIZE.

A very erroneous idea of the size of Pacific cod seems to be prevalent in certain works on ichthyology. Even as late as 1907 Evermann and Goldsborough[b] state: "We have no record of any large examples of this cod from the Pacific, where it perhaps does not reach a weight exceeding 15 or 20 pounds." Bean[c] reports having seen many which weighed not less than 30 pounds caught on the inshore banks, where the cod are notably smaller than those found on the offshore banks. He also quotes reports from others as to cod weighing from 20 to 50 pounds.

The writer spent the summer of 1913 at the Pirate Cove station of the Union Fish Co. During the greater part of the time almost no snappers were to be seen and the fish averaged very large—probably 12 to 15 pounds most of the time. On June 15 he weighed 6 cod, selected so as to show the different sizes, with the following results: One weighed 40 pounds, length 43 inches from tip to tip; one weighed 37 pounds, length 42½ inches from tip to tip; one weighed 22 pounds; one weighed 21 pounds, length 39 inches from tip to tip; one weighed 23½ pounds; one weighed 11½ pounds, length 31 inches from tip to tip.

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[a] Mr. Campbell had written for information as to how the natives could best catch cod for their own use.

[b] The Fishes of Alaska, by B. W. Evermann and E. L. Goldsborough. Bulletin, United States Bureau of Fisheries. vol. xxvi, 1906, p. 348. (1907.)

[c] The cod fishery of Alaska, by Tarleton H. Bean. The Fisheries and Fishery Industries of the United States, pt. II, sec. 5, vol. I, p. 202, 203.

He had the first fish dressed immediately after being weighed and measured, and when ready for the salting tank it weighed 21 pounds. Before being weighed in the first place all of these fish had been bled by having their throats cut.

On a number of occasions he saw fish at the shore stations which would undoubtedly run over 40 pounds if put on the scales. All of the fish noted above were from inshore banks. Cod run larger in size on the offshore banks, and it is probable that fish running from 50 to 60 pounds are sometimes taken on Slime and Sannak Banks, where the largest cod are found.

During the winter months the cod are quite thin and watery, and probably would not average in the round much more than 7 to 9 pounds.

There are no records of any monster specimens having been secured on the Pacific banks, similar to those reported occasionally from the Atlantic. Capt. J. A. Matheson, of Anacortes, Wash., who has been engaged in the cod fishery for a number of years, says that the largest dry-salted cod he ever received from his vessels weighed 18 pounds.

In the southern part of its range the cod are generally small, in many places being no larger than those known as snappers on the cod banks.

MIGRATIONS.

On the main cod banks fish are to be found throughout the year, although very scarce at times. On certain of the inshore banks cod are to be found all the year in considerable abundance, with periods of great abundance; on other inshore banks only during the winter months are the fish found in any abundance, while on others they are plentiful only during the summer months. Pirate Cove, Unga, and Kelleys Rock are all-the-year-round stations, the Sannak Island and Northwest Harbor stations are all-winter ones, while Sanborn and Dora Harbors are open only during the summer months. At the stations open the whole year the best fishing is usually from March to September, both inclusive. Part of this superiority is undoubtedly due to the better weather which prevails during these months than during the rest of the year, but the reports and statistics all agree in showing that there is a greater shoreward migration of the schools during this period.

SPAWNING.

Cod are found spawning during the winter months, principally in January and February. Those caught during February and March and the early part of April are usually quite thin, due to their having spawned shortly before this.

In many females the eggs are not extruded at the regular period, and in many instances these eventually harden into an almost solid mass. At Pirate Cove, in 1913, the author's attention was early called to these delayed spawners. The first one was observed on May 10, shortly after his arrival at the station. From then on they occasionally appeared until early in August, when they became quite numerous. On June 25 he cut out of one female a roe which weighed 8 pounds. Occasionally the eggs would be found in a mass with the usual envelope missing. In no instance that he observed did this condition seem to affect the health of the fish, all of them appearing to be normal fish so far as food qualities, weight, etc., were concerned.

YOUNG.

Dr. Bean's observations showed young cod as present in shallow water near shore at some place or other on the Pacific side between Cooks Inlet and Unalaska between May and October, and that about the middle of the latter month they reach an average length of 4 or 5 inches.

On September 7, 1913, the writer first noticed large numbers of young cod from 2 to 4 inches in length swimming around Pirate Cove harbor, and they were still there in large numbers when he left on September 26. The small native boys would occasionally catch them on a baited hook or bent pin, which the fry would eagerly pursue. They were also occasionally found in the stomachs of adults brought in by the fishermen, showing conclusively that the cod do not discriminate against their own offspring.

FOOD.

The food of the Pacific cod is as plentiful and as varied as in the Atlantic. Any fish that it can capture forms a part of its food. The writer opened and examined the stomachs of many cod at Pirate Cove station during the summers of 1912 and 1913, and he was surprised at the variety of food found therein. During July, 1913, shrimp were exceedingly abundant in their stomachs. He also found three ducks with bright red feet, known locally as "Alaska pigeons," these had evidently been swallowed but a short time before, as they were all in an excellent state of preservation. Alaska pollock (*Theragra chalcogramma*) seemed to be the chief food of the cod, although, strange to relate, it was found to be absolutely worthless as bait when cut into pieces. Sculpins are frequently found in its stomach, as are also salmon, herring (*Clupea pallasi*), capelin, halibut, and sand launce (*Ammodytes personatus*). Yellow striped fish, or "Atka mackerel" (*Pleurogrammus monopterygius*), is a popular article of food when in season. The male red rock trout (*Hexagrammos superciliosus*), which has greenish colored flesh and is given the common name of "porgy" by the fishermen, is a favorite article of food. Sometimes young cod are found in the stomachs of the adults. Octopi and shrimp are favorites of the cod, and during the summer months their stomachs will be found, in certain sections, to be filled with the latter.

OTHER MEMBERS OF THE GADIDÆ.

An odd feature of the cod fisheries of the Pacific is the total absence of the haddock and hake, which form such a large proportion of the catch of the Atlantic Gadidæ fishery. The pollock of Alaska is quite different from the one found in the Atlantic. The minor species of the Gadidæ found on this coast are described below.

Ling.—The ling (*Lota maculosa*) is our only fresh-water member of the Gadidæ, and is said to be common in the Yukon Basin, and has also been reported from the Nushagak, Fraser, and Columbia Rivers. It attains a length of 1 to 3 feet. Although fully as palatable as the ling found in east-coast streams, it is rarely utilized as food, except in British Columbia and Washington, where large quantities are marketed.

Tomcod.—The tomcod, or wachna (*Microgadus proximus*), is found in abundance from Alaska to Monterey. In the more southern portions of its range it is often sold in the markets as "smelt." In form the tomcod is a miniature cod, and there is difficulty in distinguishing the young of the two species. The tomcod rarely exceeds a foot in length and is esteemed as a delicacy in many localities.

In the northern portion of Bering Sea the wachna, as it is called, is of great importance to the natives, who depend upon it for a considerable part of their food supply during the winter season. Mr. Dall[a] has the following to say of this fishery:

> This fish much resembles the common tomcod of the Eastern States, * * * but while the latter is of most insignificant importance from its scarcity and poor quality, the former species occupies a very important place in the domestic economy of both natives and Russians on both shores of Bering Sea. It is apparently a permanent inhabitant of these coasts, but is most abundant in the fall of the year, when the ice begins to form in the rivers and along the shores. The Waukhni fishery commences about the middle of October. At first it is caught from boats anchored close inshore, but later the natives cut holes

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[a] Report of Commissioner of Agriculture for 1870, p. 381. (1871.)

in the new ice, set up two or three stakes, with a mat hung upon them to keep off the wind, and sit there all day, hauling them in as fast as the line is dropped into the water. The hook is made of white walrus ivory, furnished with a sharp pin set in obliquely, but without a barb. The whiteness of the ivory, which is kept constantly in motion, attracts the fish, but no bait whatever is used. In November, when the ice becomes very thick and the cold increases, the fish retire to deeper water, and the fishing is over until the following spring. * * * They are preserved by removing the intestines and drying in large bunches strung on seal line, or by throwing them as they are into long cylindrical baskets made of twisted grass and keeping them entire in a frozen state. * * * They are among the most palatable of the many fish found in these seas, and the number preserved is so great as to be almost incalculable. They serve the natives for food, either boiled or in the frozen state. They also form an important article of dog feed in the northern portions of Alaska near the coast.

Hon. James Wickersham, Delegate from Alaska, has furnished the author with the following description of the apparatus used by the natives and their method of operating same of recent years:

When the Eskimo woman is fishing through the ice on Bering Sea for tomcod she uses a line with a barbless hook at the end. She also has two short sticks in her hands and generally a baby strapped on her back. As soon as she gets a bite she slips one stick a foot or two down the line and begins raising it up. As soon as the stick gets too high she slips the other a few feet below the first, but on the other side of the line, and thus continues hauling in the line with the sticks alternately until finally the catch comes above the ice. With a quick movement of the line and stick the fish is shook off, and frequently before it falls onto the ice is frozen solid. The woman is wearing heavy gloves, and the reason for not touching the wet line with the gloved hands is to prevent them from getting wet and covered with ice and thus becoming useless. The line is lowered in the same manner, and from long practice the natives are very expert. The fish are put in baskets and will keep fresh as long as they remain frozen. A windbreak of ice and snow is frequently constructed.

Alaska pollock.—The Alaska pollock (*Theragra chalcogramma*) is an abundant and widely distributed species in Alaska. It is found in the Bering Sea and the neighboring waters south to Sitka and the Kurils. It usually swims near the surface and forms a considerable portion of the food of the fur seal and the cod. It reaches a length of 3 feet, although the average is more nearly about half this. At present no use is made of it as food, although it will in time become an important item in the commercial fisheries. In 1907 the writer caught a specimen at Seward, Alaska, but it was apparently so rare in that locality that no one there seemed to recognize it.

South of Sitka is found a closely related species, *T. fucensis*, which is said to be abundant in Puget Sound, and is found as far south as Monterey Bay.

Eleginus navaga is common and abundant along the entire Alaska coast, and on the Asiatic side as far south as the Kamchatka Peninsula, at least. It is rarely ever used as food, due to the great abundance of other better-known fishes.

Polar cod.—The polar cod (*Boreogadus saida*) is common along the coasts of Arctic Alaska and northern Siberia. Like the pollock, this species has the lower jaw longer than the upper. They form an important article of food with the Eskimos during certain seasons of the year. John Murdoch[a] has the following description of the fishery:

> Usually during the latter part of October and early in November, after the sea has closed and when tide-cracks form along the shore, the natives generally catch a good many of them at the very edge of the beach in about a foot of water.
>
> They use a short line of whalebone to which is attached a small lure made of blackened ivory, which roughly represents an amphipod crustacean and is armed with a barbless hook.
>
> After this no more are caught till after the return of the sun, early in February. The natives say that they go away, and it is quite probable that they leave the shore and go off into deeper water. If there were any fish to be caught, the natives would undoubtedly fish for them during the winter months, as at this season they are frequently hard pressed for food.
>
> Early in February they become exceedingly abundant in about 15 fathoms of water wherever there is a level field of the season's ice not over 4 feet in thickness, inclosed between rows of hummocks of broken ice. * * * Large numbers of the natives from the Cape Smythe village, especially women and children, resorted to this field nearly every day and caught these fish literally by the bushel.
>
> The fish are jigged and the hook is kept near the bottom.

SPECIES MISCALLED COD.

A confusing feature on the Pacific coast is the number of species, unrelated to the Gadidæ and none of which resemble the true cod. which are commonly known as cod and which are frequently classed with the cod by the uninitiated. Among these the more prominent are the following: Cultus cod, blue cod, or buffalo cod (*Ophiodon elongatus*), is a large, coarse fish reaching a length of 3 to 4 feet, and a weight of 30 or 40 pounds, with the flesh a livid blue or green in color. It is found from Sitka to Santa Barbara, and is especially important as a food fish in British Columbia and the State of Washington. In cooking, the flesh of this fish turns white.

Black cod, coalfish, beshow, or skill (*Anoplopoma fimbria*), is found from the Aleutian Islands to Monterey. It is most abundant in the regions frequented by the halibut, from southeast Alaska to the Washington coast. It attains a length of 18 to 20 inches and a weight of 5 pounds. Many are marketed in a fresh, frozen, or salted condition, and the fish is growing steadily in popularity. It is usually taken in deep water, from 70 to 90 fathoms, though it is often found even at depths of 200 to 250 fathoms.

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[a] Natural History, Report of the International Polar Expedition to Point Barrow, Alaska, Fishes, p. 129–30. (1885.)

Several species of Sebastodes (notably *S. ruberrimus*, *S. pinniger*, and *S. mystinus*), known as red rock cod, are found from San Diego to Alaska. They are excellent food fishes and are in considerable demand.

BANKS FREQUENTED BY COD.

The codfishing banks are of two kinds—the inshore banks, which lie close in to shore, or in the bays, straits, and sounds between the numerous islands and the mainland and between the islands themselves, and the outer banks, which lie at varying distances off the mainland or the various groups of islands. Together they form by far the largest group of cod banks in the world.

Outside of the surveys made by the United States Bureau of Fisheries steamer *Albatross*, very little has been done to fix with certainty the boundaries of the various banks and much remains to be accomplished in this line. The *Albatross* survey has been supplemented by data obtained from fishermen frequenting these banks and from personal observation over a period comprising several fishing seasons.

According to the investigations of the *Albatross*, the following represent, roughly, the areas of the offshore banks upon which she worked, although in several instances the work was suspended before the end of the bank was reached:

	Sq. miles.
Slime Bank	1,445
Baird Bank	9,200
Between Ugomak Island and Killuluk Bay, in the Pacific Ocean	2,000
Davidson Bank	1,600
Sannak Bank	1,300
Between Sannak and Shumagin Banks	1,800
Shumagin Bank	1,800
Albatross Bank	3,700
Portlock Bank	6,800
Total	29,645

Practically no attempt was made by the *Albatross* to seek for cod banks along the Aleutian Chain west of Akutan Pass, where cod are said to be numerous. Also no attempt was made to find banks in Bering Sea north of Cape Newenham, although cod have been found as far north as St. Lawrence Island.

No estimate has ever been made of the extent of the inshore banks, which are very extensive. It is probable that these would be from one-third to one-half the area of the offshore banks, possibly more.

No one knows the extent of the cod banks along the Asiatic shores of the Pacific Ocean, but they can not be much smaller, if any, than those on the American side, and it is possible that more extended investigations will develop that they meet the American banks at certain places.

OFFSHORE BANKS IN BERING SEA.

Owing to a lack of good harbors in Bering Sea, the offshore banks are the only ones frequented at present by the fishing vessels, and these are amongst the most productive in all Alaska. As the holding ground on these banks is good, a properly equipped vessel finds little difficulty in riding out all ordinary gales. All cod banks so far found are mostly situated to the eastward of a line connecting Cape Newenham with the northwest cape of Unimak Island and off the northern side of Unalaska Island.

Slime Bank.—The first cod bank to be reached by a fishing vessel after entering Bering Sea is Slime Bank. As delineated by the *Albatross*, it begins directly off Cape Sarichef, the northwest cape of Unimak Island, is elongate in shape, and follows approximately the trend of the adjacent coast to within a few miles of Amak Island, its inner margin lying only a short distance off the land. It is about 85 miles in length and 17 miles in average width, broadening somewhat at the eastern end; its total area is estimated at about 1,445 square miles. The depths found on the bank range from 20 to 50 fathoms, while the bottom consists generally of black sand and gravel, frequently intermingled with pebbles, and sometimes of gray and yellow sand, rocks also occurring near the shore.

The deep water lying off the northern entrance to Unimak Pass forms the western end of the bank, 70 fathoms being found near the edge and depths exceeding 100 fathoms a short distance farther away. Off its northern edge the depths determined by the soundings of the *Albatross* range from 53 to 62 fathoms, with muddy bottom at three of them. Toward the eastern end, however, on the northern side sand and gravel occur, and in this locality the precise limits of the bank are still undefined.

There are no harbors suitable for cod vessels along the adjacent shore, although protection may be found in several bays, notably Dublin and Shaw Bays, during southeast to southwest winds. Amak Island, which lies about 11 miles off Izenbeck Bay, also furnishes some protection during the prevalence of southeast and southwest winds.

The bank derives its name from the presence of immense numbers of a large jellyfish, brownish or rusty in color, measuring 6 to 18 inches across the disk, and provided with long slender tentacles having great stinging powers. It is said by the fishermen that the jellyfish are never observed upon the surface of the sea, but seem to occupy an intermediate zone toward the bottom. They claim that these animals sometimes interfere with the hooks reaching bottom, and by covering the bait render it unattractive to the fish. When brought to the surface they are uncomfortable objects for the fishermen to disentangle from the hook and line. They do not become abundant until the latter part of June, when the fishermen generally move on to Baird Bank.

Probably the finest cod secured on any of the Alaska banks are taken on Slime Bank.

Baird Bank.—Baird Bank, so named by Capt. Tanner of the *Albatross* in honor of Prof. Spencer F. Baird, the first United States Commissioner of Fish and Fisheries, was then generally known to the fishermen, and is yet to a few of them, as the Port Moller bank or ground. As described and charted by the *Albatross*, it commences a few miles east of Amak Island and extends northeastward off the northern side of the Alaska Peninsula to the vicinity of Cape Chichagof, at the mouth of the Ugaguk River, a distance of about 230 miles. It has an average width of about 40 miles and an extreme width of 58 miles, its total area being estimated at about 9,200 square miles, making it the largest known bank in Alaska, and some 800 miles more than that of Georges Bank, in the North Atlantic Ocean.

The *Albatross* investigations indicated, however, a strong probability that the Kululak ground and the region off Cape Pierce are really extensions of this bank, the investigations not having been carried to a definite conclusion with respect to this matter. Outside of Bristol Bay the observations were not carried beyond the limits of the bank as defined by the *Albatross*, and the entire width of its western portion still remains to be determined. It is also not impossible, according to Capt. Tanner, that some connection may be found to exist between Baird and Slime Banks to the north of Amak Island. A line of stations from Cape Newenham to the Northwest Cape of Unimak Island, however, showed good fishing only in the vicinity of land.

Like Slime Bank, but few harbors are to be found along the shores adjacent to Baird Bank. Vessels occasionally take refuge in Port Moller, Herendeen Bay, and Port Heiden, but usually the vessels ride out the storms or draw in close to the peninsula shore during southeast winds.

Kululak Bay.—Kululak Bay occupies a large part of the region included between Cape Constantine and Cape Newenham and contains Hagemeister Island and the Walrus Group. Within this area the *Albatross* investigators found cod in isolated spots, scarcely entitled to the name of banks. Extensive shoals occur off Hagemeister and the Walrus Islands, 6 fathoms being found about 15 miles to the southward of the latter. The principal fishing grounds are outside of these shoals as well as to the eastward and westward of them, in depths of 12 to 25 fathoms, the bottom consisting generally of sand, with some mud and gravel, and the fauna being essentially the same as on Baird and Slime Banks.

Some years ago the fishermen occasionally resorted to a small ground, called Gravel Bank, situated about 16 miles south-southwest from the southern end of Hagemeister Island, where large cod are reported to be abundant. It has depths of 16 to 20 fathoms, but its size is inconsiderable.

Vessels entering Bering Sea fish first on Slime Bank, usually in or just off Dublin Bay. From here they work to the eastward, leaving for Baird Bank when the jellyfish become too numerous on Slime Bank. No fishing is now carried on in the Kululak ground.

The *Albatross* investigations were not carried north of Cape Newenham; cod have been reported at various places between here and Bering Strait and in the Arctic. They are said to be abundant in the neighborhood of St. Lawrence Island.

OFFSHORE BANKS IN THE NORTH PACIFIC OCEAN.

The *Albatross* ran three lines of soundings over the area lying between the longitude of Ugamok Island, at the southern entrance to Unimak Pass, and that of Kiliuluk Bay (longitude 164° 55′ to 167° west) and between the coast and the inner edge of the steep submarine slope. These soundings were not sufficient to demonstrate the existence of a defined bank in this region, but it was estimated that an area of about 2,000 square geographical miles was suitable for fishing. This has been borne out by the experiences of a number of fishing vessels which have made good catches at certain places in this area on various occasions.

Even farther to the westward occasional trials have been made by cod vessels, when becalmed inside the 100-fathom curve or when seeking water, and good catches of cod made.

Davidson Bank.—This bank was first reported by Prof. George Davidson, of the United States Coast Survey, about 1868, and was named in his honor. He made a number of soundings upon it in depths of about 50 fathoms and found cod abundant in some places. In 1888 the *Albatross* established the outline and surface contour of this bank with considerable accuracy.

The bank lies south of Unimak Island and extends westward from the neighborhood of the Sannak Islands to about the longitude of the southern entrance to Unimak Pass (about longitude 164° 40′ west). Its eastern end seems to be continuous with the shoal water surrounding the Sannak Islands. The greatest width of this bank off Unimak Island is 45 to 50 miles. Depths less than 50 fathoms were found over a large part of the bank, 41 fathoms being the shoalest water discovered. Between the shallow area and the islands to the north and northwest of it depths of 50 to 72 fathoms occur. The area of Davidson Bank is estimated at about 1,600 square miles.

The bottom upon the bank consists, in different places, of fine to coarse sand, pebbles, and gravel. Green mud is found at a depth of 95 fathoms near the outer edge of the bank and black sand in 342 fathoms just off the bank.

Sannak Bank.—The principal bank resorted to by the few vessels which fish throughout the season in the North Pacific is Sannak Bank. This bank lies to the east and southeast of the Sannak Islands, is somewhat elongate in shape, and trends in a general way northeast and southwest. About the central spot on the bank is in latitude 54° 20′ north, longitude 161° 53′ west. To the westward it joins Davidson Bank, the dividing line being at a point approximately south of the middle of the group. The soundings on this bank show depths from 30 to 82 fathoms. Much of the bottom is rocky; sand, pebbles, gravel, etc., also occur. The estimated area of the bank is 1,300 square miles.

The cod taken on this bank are very large and of excellent quality, and are the finest fish taken on any of the Alaska banks with the exception of those from Slime Bank in Bering Sea.

To the mariner unacquainted with these waters this is a dangerous region, but to one acquainted harbors of refuge are numerous. Caton Harbor, formed by Caton, Elma, and Sannak Islands, is the chief place of refuge for the larger vessels, as it is easy to get into from either the northern or southwestern entrance, and when inside there is excellent holding ground and ample protection from all winds. Small vessels, especially power vessels, in case of storm generally anchor close in to the leeward of Caton Island and are safe. On the northern side of Sannak Island vessels drawing 14 and 15 feet can easily enter Pavlof Harbor at high tide, but at low tide vessels drawing more than 6 feet would have difficulty in entering. The channel is rather tortuous but is buoyed. Inside the anchorage is rather limited, as the harbor is small. The Union Fish Co. has a large station here, and vessels can lie alongside the dock at all stages of the tide, large ones usually resting easily in the mud at low tide. Johnsons Harbor, where there is another station of the same company, can be entered at any stage of the tide, the entrance being unusually free from obstructions, but the harbor is so shoal throughout the greater portion that the vessel anchorage is largely restricted to the western part, a little inside the entrance. Farther to the westward are Moffets Cove and Company Harbor, on both of which are shore stations of the Alaska Codfish Co., and which are available to all cod-fishing vessels at high tide.

When fishing on this bank the larger vessels generally ride out storms. When the vessel begins to drag the anchor is usually buoyed and the vessel either puts to sea or goes to Caton Harbor.

Between Sannak Bank and the beginning of the Shumagin Bank to the eastward lies a large area of comparatively shoal water, over the greater part of which cod are to be found in varying abundance, although this ground is not much frequented, owing to the absence of convenient safe harbors in its western half, and the presence of the dangerous Sandman Reefs to the northwest. In the eastern portion vessels can easily find shelter among the Shumagin Islands. A few vessels occasionally fish for a short portion of the season in this region. This area shows depths of 38 to 74 fathoms and is, roughly, about 1,800 square miles in extent. The bottom is exceedingly variable, consisting in different places of sand, mud, pebbles, gravel, and rocks, the latter occurring only near Sannak Bank on the one side and near the Shumagin Islands on the other.

Shumagin Bank.—Shumagin Bank lies to the south and southeast of the Shumagin Islands, with its outer margin following approximately the trend of the coast line formed by the adjacent islands. On the westward the bank has been traced to about longitude 159° 52′ west, but undoubtedly extends farther in this direction. East of the Shumagin Islands it reaches north to the latitude of the upper end of Big Koniuji Island. Its width within the 100-fathom curve to the south of the group varies from 15 to 35 miles to the nearest outlying island, while its area has been estimated at about 1,800 square miles. The depths over a large part of the bank are less than 50 fathoms, the bank not being separated from the islands by deep water. The character of the bottom on the bank varies greatly, sand, pebbles, gravel, broken shells, mud, and rocks being found in different places. Rocky patches are of frequent occurrence, even in comparatively deep water. These rocky patches are a grave source of danger to vessels anchored on the bank, as they chafe and break rope cables. The schooner *Vega* fished on this bank, to the south of Simeonofski Island, in 1913 and 1914, and was compelled to use a couple of shots of chain next to the anchor in the latter year, having lost an anchor the previous year because a rope cable was employed. Owing to this danger and the strong tides, few vessels have ever made a practice of fishing on this bank, although the fish rank in quality next to those caught on the Sannak Bank.

The area between the Shumagin Islands and Kodiak is very imperfectly known, largely because the fishing vessels do not frequent it, preferring to visit the better-known banks. The *Albatross* (in 1888) ran a single series of soundings across this wide area, with a double line extending from the neighborhood of Lighthouse Rocks to Mitrofania Bay. These showed on the single-line depths of 26 to 137 fathoms, while the double line showed depths of 44 to 73 fathoms.

Albatross Bank.—This bank lies off the southeastern side of Kodiak Island and extends the entire length of that island as well as in front of the Trinity Islands. At the eastern end it is practically continuous with Portlock Bank. Along some portions of the coast, as in the neighborhood of Sitkalidak Island, the bank is separated from the land by comparatively deep water, while in other places shoal water intervenes. The 100-fathom curve is distant 25 to 45 miles from the land, inside of which limit there is an estimated area of 3,700 square miles. Depths from 40 to 60 fathoms are most common on the bank. Beyond the 100-fathom line the slope is very abrupt. All varieties of bottoms occur, sand being most prevalent, and rocky patches common.

Prof. George Davidson, one of the earliest investigators of the fishing banks off this portion of the Alaska coast, predicted the existence of this bank upon the evidence of a few isolated soundings. The bank was later named after the *Albatross*, which surveyed it.

In the early years of this industry this bank was frequented by small vessels with headquarters at Kodiak, but as most of the fish taken are smaller than on the other offshore banks, it has not been much resorted to in recent years.

Portlock Bank.—Portlock Bank extends northeastward from Kodiak Island to about longitude 148° 30′ west, a distance of 110 to 120 miles, and is widest at the western end. Its outline, as indicated by the 100-fathom curve, is irregular. It is the largest single bank south of the Alaska Peninsula, its area inside of the 100-fathom curve being about 6,800 square miles. The boundaries of this bank have not been conclusively established as yet, and it may eventually turn out to be much larger than supposed. No soundings were made by the *Albatross* nearer than 16 miles south of the Kenai Peninsula. Between longitudes 150° and 151° west the bank abruptly narrows, and thence maintains a width of 35 to 45 miles to its eastern end. There is a broad indentation, with depths of 102 to 166 fathoms, on the southern side; depths of 105 to 122 fathoms occur just off the northern border, and 106 to 761 fathoms off the eastern end, close to the 100-fathom curve.

The soundings made by the *Albatross* between longitude 150° west and the eastern end of the bank, inside of the 100-fathom line, show depths of 66 to 99 fathoms. Near the central part of the bank, between longitudes 150° and 151° west, two soundings of 37 fathoms occur, while on the southern part depths of 40 to 72 fathoms were found. Between longitudes 151° and 152° west, the latter marking approximately the western boundary of the bank and the coast line, the depths, according to the soundings of the *Albatross*, range from 20 to 81 fathoms, the latter occurring near the land; but there were no indications of a marked or extensive depression between the bank and the shore.

Gray sand prevails over most of the bottom, mixed with pebbles, gravel, and broken shells in places, with occasional patches of mud and some rocky spots on the western part of the bank.

In 1888 the *Albatross* made a single series of soundings between the eastern end of Portlock Bank and Middleton Island, which showed depths of 87 and 101 fathoms about midway between the two, indicating a small area surrounded by much deeper water.

In 1911 the *Albatross* covered this same region more extensively in its search for halibut banks, but on neither occasion were cod found.

During the latter investigations the region between Middleton Island and Dixon Entrance was covered by the *Albatross*, but only an occasional cod was found, and the work of the halibut vessels over this area indicates that cod are quite scarce.

INSHORE BANKS.

These banks are generally close to shore, usually around islands, and are the ones resorted to by the fishermen from shore stations adjacent, from whence the cured product is shipped to market, or by the natives and whites living close by, who catch enough for their immediate wants or cure a few for their food in winter. Observations at a number of places show that cod caught close to the mainland shores are generally smaller than those found on the offshore and the island inshore banks. Practically no cod are taken for market on the inshore mainland banks.

It was noticed that cod in a sick condition generally sought the shelter of the harbors. At Pirate Cove, in the Shumagins, and at Pavlof, on Sannak Island, the writer frequently noticed medium-sized cod in the harbors, and almost invariably these were found to be sick or diseased. A few yards outside the harbors only clean, healthy fish would be found, thus showing that their condition caused the diseased fish to seek the shelter of the harbor.

There are a few small banks in southeast Alaska. These banks, which vary from 5 to 7 fathoms in depth, are mainly in Chatham Straits, Lynn Canal, and Icy Straits. The fish are found on the banks in the summer, disappearing into the deeper water in the fall. The fish caught are comparatively small, examples more than 24 inches in length being rare.

Although cod are occasionally found near Sitka, Yakutat, in Prince William Sound, and Port Graham, near the lower end of the

Kenai Peninsula, but few are ever taken by fishermen. At one time considerable cod were taken by the natives living on Kodiak, Afognak, and adjacent islands, but of late years the natives have devoted most of their time to the salmon fishery. The fact that the cod found on these banks are quite small has militated heavily against their sale in a dry-salted condition, in which trade only large fish are of much value. In 1909 the Alaska Commercial Co., at its Kodiak station, purchased from the native fishermen and dry-salted a considerable quantity of cod, but they were so small that they could be marketed in San Francisco only at a loss, with the result that the fishery was abandoned. If these small fish had been pickled they would have found a small but growing market for them in the coast States.

In Chignik Bay cod are frequently found. At Mitrofania the natives cure considerable quantities for their own use, while in 1912 some stockfish was prepared by a number of the natives. In 1912 the writer investigated the ground off Ivanof Bay. Good, large cod are to be found here, but the vessels have never found it necessary to resort to this ground, while a shore station could not operate, as, should the wind from the ocean suddenly shift to the land, a dory would be blown straight out to sea. A vessel would find Kupreanof Harbor a very safe and convenient refuge.

On Herendeen Island, on Northwest Harbor, a small island to the northward of Little Koniuji Island, are located two shore stations, which are operated during the winter and spring months; during the last two seasons with but indifferent success. During the summer months the cod are mostly on the offshore banks, too far away for the dories to operate. Several vessels have operated with marked success on this offshore bank, which is really a prolongation of Shumagin Bank, but as the bottom is rocky anchors are frequently lost.

In the Shumagin and Sannak Groups shore stations to operate on the inshore banks have reached their greatest development.

In the Shumagins these banks are very numerous, spots where cod can not be taken at some time during the year being exceedingly infrequent. The best-known banks are in West Nagai Strait and Gorman Strait. The majority of the Shumagin Island stations are on the former sheet of water, it forming practically one continuous bank. On the western side fishing is carried on throughout the year, while on the eastern side fishing is generally begun in May and ended in August—June and July being the best months. The stations on the western side find the cod most abundant from March to October, the former month being the best. It is probable that they are just as abundant during the rest of the year, but the weather generally prevents much fishing. A considerable part of this bank, lying throughout the middle of the strait, has been but little fished, as the dories could not work that far from shore. During the last two years, however, the number of power fishing boats has been considerably increased, and as these are enabled to go much farther from shore than the dories which are propelled by oars or sails, the middle ground is being worked more thoroughly. Occasionally the smaller vessels, with headquarters at the stations, have frequented the outer banks in West Nagai Strait. Around the Haystacks is an especially good fishing ground for a power fishing vessel. This ground runs from the pinnacle off East Head and the eastern point of Porpoise Harbor north to the southeast end of Andronica Island; is also said to extend toward Wedge Cape, at the upper end of Nagai Island. The bottom on this ground is smooth, and is composed of fine hard gravel; depth of water about 30 fathoms. The strong tide and the proximity of the numerous small islets forming part of the group make a power vessel necessary.

Should otter trawling ever be adopted for codfishing, West Nagai Strait would be one of the most favorable spots in all Alaska for its operation, as it has a comparatively smooth sandy bottom with depths throughout the greater portion from 25 to 40 fathoms.

Pirate Cove, the oldest shore-fishing station operated in Alaska, is located on the northeast point of Popof Island. The grounds frequented by the fishermen of this place lie in Gorman Strait, between Popof and Korovin Islands, and along the eastern side of the island as far south as Popof Head.

In Unga Strait an inshore bank begins at Gull Island in 40 fathoms, and runs west to Bay Point (known locally as Niggerhead). The bank is about a mile offshore and is about a mile in width, with a depth of about 30 fathoms nearly everywhere. Bottom is of packed sand with very little moss.

In Portage Bay (now known as Balboa Bay) is a small bank upon which large fish may be taken during the summer months. The bank runs up the middle of the bay to the 5-fathom sounding. The soundings on the bank run from 25 to 35 fathoms. The bottom is of gravel, with numerous holes.

In Beaver Bay, along the Peninsula, good fishing may be had. The bottom here is sandy and the depth averages about 25 fathoms.

On the northern, eastern, and western shores of the Sannak Islands are to be found inshore banks on which cod are to be found throughout the late fall and winter, but the fish are in too deep water for the station fishermen throughout the rest of the year. On the northern side are four shore stations. Owing to the danger of the fishermen being blown to sea in the gales which spring up very suddenly in this region, no shore stations have been established on the south side.

Along the shore of Unimak Island, from Cape Pankof to Cape Lutke, codfish used to be quite numerous during the summer months. This ground is really the inshore portion of Davidson Bank. At Dora Harbor, on the south side of Ikatan Peninsula, Unimak Island, are located two shore stations, and the fishermen from these fish out around Bird Island. For a year or two after the stations were opened they made big catches, but after that they dwindled until about 50,000 fish now represent the combined catches. Several schooners usually fish on the main ground a few miles offshore during the spring months, off Cape Pankof being a favorite spot.

Just off Akutan Harbor, on Akutan Bay, cod are said to be abundant. While the schooner *Vega*, of Seattle, was taking aboard water in the harbor late in June, 1911, her fishermen, hand-lining from dories around the mouth of the harbor, caught 1,500 cod on one day and 2,700 the day following. The *Albatross* investigations in the same year showed that cod were abundant and quite large close inshore off North Head, Akutan Island.

The *Albatross* investigations showed that cod were abundant directly off Chernoffsky Bay, on the Bering Sea side of Unalaska Island, during the summer, and it is very probable that investigation will some day disclose many other inshore banks at various places along the Aleutian Islands where cod can be caught at all or some seasons of the year.

But little is known of the inshore banks on the north side of the Alaska Peninsula, mainly because, owing to the lack of safe and convenient harbors adjacent to the banks, shore stations can not be operated.

BANKS ON THE ASIATIC SHORE.

But little is known of the extent of the cod banks along the Siberian coast, as no detailed or even sectional surveys have been made of them. Our own vessels have done more toward showing their extent and productiveness than those of any other nation. The principal banks lie in the Okhotsk Sea and the Asiatic side of Bering Sea. How far north the fish range is still undetermined, but it is probable that they will be found about as far north on the Asiatic shore of Bering Sea as they are on the American shore; that is, to St. Lawrence Island. They are said to be found as far south as Chosen (Korea) and northern Japan.

HISTORY OF THE PACIFIC CODFISHERY.

The history of the Pacific codfishery is a record of the strenuous struggle of a few individuals and companies against its giant brother on the Atlantic coast, which, backed by great wealth, the prestige and advantage gained by years of unopposed command of the American markets, an almost unlimited supply of raw product, and during the last two seasons the ability to import from the eastern Provinces of Canada large supplies free of all duty, has had an immense advantage over its younger and weaker brother. On this coast it has not been a question of being able to secure cargoes, but has been one of finding a market for the catch; a vastly greater catch could be made were a market available for it.

The fact of the presence of cod in Alaskan waters has long been known. In the speech of Hon. Charles Sumner,[a] on the cession of Russian America to the United States, and which had such a powerful effect in favor of the treaty of cession then pending, is an abstract of the references made by early navigators and visitors in Alaska to its fishes. The first mention was made by a Russian navigator in 1765, who reported "cod, perch, pilchards, smelts," as being found around the Fox Islands. Other navigators and explorers who reported the presence of cod were Cook (1786), Portlock (1787), Meares, Billings (1792), Langsdorf (1804), Sutke, and Sir George Simpson (1841), all of whom speak of it as being a very common fish. But little use was made of it, however, owing to the abundance of salmon.

It is reported that in 1866 two or three small schooners fitted out at Victoria, British Columbia, and fished with fair success on the grounds immediately north of the Nass River. It is a question whether this fish was the true cod or one of the several unrelated species which bear the common name of cod.

Capt. Matthew Turner seems to have been the pioneer in the discovery of the commercial possibilities of the great cod banks of the Pacific Ocean. Mr. W. A. Wilcox, late field agent of the now United States Bureau of Fisheries, received from the late Capt. Turner the following facts in connection with his discovery of various banks and his exploitation of same:[b]

> In 1857 Capt. Matthew Turner, master of the brig *Timandra*, 120 tons, sailed from San Francisco with an assorted cargo for Nicolaevsk on the Amoor River. He was detained, however, for three weeks at Castor Bay, at the head of the Gulf of Tartary, because the Amoor River was full of ice when he reached the Asiatic coast. While the vessel lay there waiting, anchored in 3 fathoms of water, the crew began fishing over the rail with hand lines simply as a pastime. They were surprised to find plenty of cod, averaging about 2 feet in length. Capt. Turner had not previously seen codfish, but some of his crew were familiar with the species, and he, knowing their market value at San Francisco, appreciated the importance of the discovery and became interested in the fishing. Two years later Capt. Turner made another trip to the

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[a] Speech of Hon. Charles Sumner, of Massachusetts, on the cession of Russian America to the United States, 48 p. Washington, 1867.

[b] Report on the fisheries of the Pacific coast of the United States, by J. W. Collins. Report of United States Commissioner of Fish and Fisheries for 1888, p. 92, 93. Washington, 1892.

Amoor River. Reaching Sakhalin Island, off the Gulf of Tartary, he began fishing for cod and found them very abundant. Only enough were taken for ship's use, however, for he was not provided with the means to cure more.

In 1863 Capt. Turner once more sailed in the *Timandra* to Amoor River. But this time he went prepared to catch and cure some cod on his return voyage. Besides fishing gear he carried 25 tons of salt. Returning he stopped to fish at the Gulf of Tartary. Cod were plentiful at first, and 10 tons were taken in a few days and salted in kench. But suddenly the fish disappeared and none could be caught. Then the brig ran down the coast to southern Kamchatka, where fish were found in abundance, and excellent success was met with on the first day. The vessel lay near the rocky coast, and on the second day, during the prevalence of a dense fog, both anchors were lost. This mishap compelled Capt. Turner to abandon fishing and to leave the coast; he reluctantly sailed for home. His fish sold at San Francisco for 15 cents per pound, and his voyage would have been notably profitable if the loss of anchors had not interfered with obtaining a full fare. This was the first occasion that salt cod were landed on the west coast from Pacific fishing grounds.

In 1864 Capt. Turner sailed in his brig on a cod-fishing voyage. Thus the *Timandra* was the first vessel to engage in this industry from Pacific ports. On the same grounds visited the previous year a fare of 100 tons of codfish was obtained and the voyage was remunerative. The same year the schooner *Alert* made a trip to Bristol Bay, Alaska, in pursuit of cod. Her voyage proved a failure, for she took only 9 tons of fish.

Capt. Turner states that since he made his voyages to the Gulf of Tartary, as related above, no American vessels have gone there to fish for cod. His success, however, had a very decided effect upon the cod-fishing business in the North Pacific, and in 1865 six vessels sailed from San Francisco to the Okhotsk Sea in pursuit of cod. These were the first American vessels to visit that region on cod-fishing trips, and their sailing evidenced a resolution to begin the business upon a broad commercial basis.

But Capt. Turner, who seems to have possessed the spirit and enterprise of a pioneer or discoverer, determined to look for cod-fishing grounds nearer home. Not disheartened by the ill success of the *Alert* in 1863, he sailed for Alaska on the schooner *Porpoise*, of 45 tons, March 27, 1865, and arrived at the Shumagin Islands May 1. He began fishing the same day. Cod were abundant and close inshore. As a result, he returned to San Francisco on July 7 with a fare of 30 tons of fish—something less than a full cargo, which might easily have been secured, only for the desire to market the catch in advance of the arrival home of the vessels that had sailed to the fishing grounds on the Asiatic side of the Pacific. This was the first fare of cod from the Shumagin Islands, a locality since famous in the annals of the Pacific codfishery.

The cod-fishing fleet of 1864 was composed wholly of rather small-sized schooners, most of which were originally built in New England for the Atlantic fisheries, but had sailed around Cape Horn to find employment in the business of the Occident. It is remarkable that one of those that crossed the Pacific, sailing about 5,000 miles from home, was only 20 tons, a mere boat in which to make such a voyage, and to return loaded "nearly decks to the water." Following are the names and tonnage (in round numbers) of the fleet: *Equity*, 63 tons; *Flying Dart*, 84 tons; *H. L. Ruggles*, 75 tons; *J. D. Sanborn*, 71 tons; *Mary Cleveland*, 91 tons; *Porpoise*, 45 tons; and *Taccon*, 20 tons.

The Okhotsk Sea fleet all secured full fares and returned in safety. The fish were small, averaging only about 3 pounds each when dry. But in those early days they were in demand and sold for from 12½ to 15 cents per pound, a price that gave remunerative returns and the promise of future success for the fishery. There was no lack of cod, and even with the method of fishing with hand lines over the vessel's side then in vogue, no difficulty was experienced in filling moderate-sized schooners in a reasonable time.

The first vessel to visit Bering Sea for cod was the schooner *Alert*, from San Francisco, in 1864. But little is known of this vessel and her owner or owners, but it is recorded that the venture was a failure, as only 9 tons of cod were secured.

The regular Bering Sea fishery was inaugurated by the schooner *Tropic Bird*, owned by the McCollam Fishing & Trading Co., of San Francisco, in 1882. The schooner *Isabel* also visited the Bering Sea banks a few weeks later than the *Tropic Bird.* Both made good catches, and as a result the next year five vessels visited these banks.

The schooner *Minnie G. Atkins* in 1867 discovered the Simeonofsky Bank, or what is now known as the Shumagin Bank. It was next visited by the schooner *Shooting Star*, formerly of Vinal Haven, Fox Island, Me., in 1870, and next by the *Scotland* and *Amanda Ager.*[a]

The first fleet of any size to fish around the Shumagin Islands was in 1867 and consisted of three schooners, the *Sanborn*, Capt. Morse; the *Porpoise*, Capt. Turner; and the *Sarah Louise*, Capt. Holcomb. Most of the fish were caught off the western side of Nagai Island, on banks discovered the same season by these vessels.

J. L. McDonald[b] has the following to say as to the influence of the discoveries of these prolific banks in the Gulf of Alaska upon the negotiations for the cession of Russian America to the United States:

> In January, 1866, the author, while attending the session of the legislature at Olympia, the capital of Washington Territory, determined to make another bold push for Alaska by soliciting the good offices of our Government for the purpose of obtaining a permanent foothold and to open the prolific fishing grounds in those regions to our ambitious fishermen. To this end we penned the following memorial:
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> "To His Excellency ANDREW JOHNSON,
> "*President of the United States:*
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> "Your memorialists, the legislative assembly of Washington Territory, beg leave to show that vast quantities of cod, halibut, and salmon of excellent quality are found along the shores of Russian America. Your memorialists respectfully request your Excellency to obtain such rights and privileges of the Government of Russia as will enable our fishing vessels to visit the harbors and its possessions, to the end that fuel, water, and provisions may be obtained; that our sick and disabled fishermen may obtain sanitary assistance, together with the privilege of taking and curing fish and repairing vessels in need of repairs. Your memorialists further request that the Secretary of the Treasury be instructed to forward to the collector of customs of this (Puget Sound) district, such fishing license, abstract journals, and log books as will enable our hardy

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[a] The Cod Fishery of Alaska, by Tarleton H. Bean. The Fisheries and Fishery Industries of the United States, pt. II. sec. 5, vol. I, p. 213. Washington, 1887.

[b] Hidden Treasures, or Fisheries Around the Northwest Coast, by J. L. McDonald, p. 11.

fishermen to obtain the bounties now paid to the fishermen in the Atlantic States. Your memorialists finally pray your Excellency to employ such ships as may be spared from the Pacific naval fleet in surveying the fishing banks known to navigators to exist from the Cortez Bank to Bering Strait."

This memorial, written by a fisherman in behalf of the fishing industry on the northeast [west] coast, passed both branches of our Territorial legislature with commendable unanimity and dispatch. In forwarding a copy of the abovenamed memorial to the Secretary of State we imparted such information touching the fisheries around the Russian possessions, and the impulse which the opening of those resources to our fishermen would impart to the commercial development on the northwest coast. In acknowledging our humble services the illustrious Secretary assured us that "in consummating the recent purchase, I was strongly fortified by the letters which you wrote to me touching the valuable fisheries in those waters." The New York Times of April 1, 1867 (the acknowledged organ of Secretary Seward), said "that a memorial from the Territorial legislature of Washington Territory, dated January, 1866, asking the President to obtain certain rights for the fishermen, was the foundation of the present treaty."

On the 18th of October, 1867, the transfer of this vast territory from Russia to the United States was officially consummated by the respective commissioners of the two Governments at Sitka, in the presence of the Russian population, who cheerfully welcomed the few Americans there also present. The union has been very cheerfully accepted by the people of the Territory. Our Government, on assuming possession, found numerous adventurers from the Pacific States domiciled in various parts of the Territory engaged in trade and in developing the resources in those regions; vessels laden with ware entered every harbor; stores were opened as by magic in every acceptable roadstead along the southern and western coasts; an active competition for furs, oil, ivory, old copper, iron, and junk was earnestly inaugurated; commerce revived, the sails of our vessels whitened every creek, bay, and sound, and the staid Russians very soon obtained an insight into Yankee progress on the go-ahead principle.

The acquisition of Alaska by the United States in 1867 proved an especial boon to our cod fishermen, as it secured them from any interference on the part of the Russians, who had not welcomed them very heartily in previous years. This is well shown by the fact that while the fleet in 1867 numbered 3 vessels, the fleet of 1868 comprised 14 vessels.

The first vessel to attempt to make two trips in one season was the schooner *Porpoise*, Capt. Caton, in 1868, but she got only half a fare on the second.

The first Alaska vessel in the fishery was one owned by Capt. Haley, of Wrangell, who in 1879 visited the Hoocheno Bank, in Chatham Strait, southeast Alaska, and purchased his fare from natives who claimed the exclusive right to engage in the fishery. These fishermen used bark lines, with wooden iron-pointed hooks, and, as they considered a catch of 30 or 40 fish a good day's work, Capt. Haley had to wait quite a while before he could accumulate a cargo. In later years several vessels engaged in the business along the same lines as Capt. Haley.

An odd feature of the Pacific cod fisheries is that neither Portland nor Astoria have ever had vessels engaged in it. In 1877 Capt. Joshua Slocum, with the schooner *Pato* (about 45 tons register), was at the Philippine Islands, when he conceived the idea of making a cod-fishing voyage to the Okhotsk Sea and marketing his catch at the islands. Leaving the islands in March, he proceeded to the Okhotsk via Yokohama. Salt and fishing gear were obtained from vessels met with on the sea, and a cargo of 23,000 fish was soon taken. When the time for sailing arrived the captain decided not to return to the islands, but took his fare to Portland instead, where he sold it at a profitable price. This was the only fare of cod to be landed at Portland.

For the first few years of the fishery no suitable arrangements were in existence at San Francisco or elsewhere on the coast for curing the fish. In certain cases the fishermen received their share of the voyage in fish, which, after being cured in a good, bad, or indifferent manner by themselves, were hawked around the city.

The late Thomas W. McCollam, of San Francisco, enjoys the distinction of having been the first man on the Pacific coast to establish the industry on a permanent basis. In 1867 he bought his first cargo of cod, and the next year he bought and cured several cargoes at Old Sausalito, but as this locality was not satisfactory he soon after established a new station at the mouth of Redwood City Creek, about 30 miles south of San Francisco.

Having decided to engage directly in fishing himself, Mr. McCollam went east in 1868, and in New England purchased the fishing schooners *Rippling Wave*, *Wild Gazelle*, and *Flying Mist*. The first was lost on the passage in Magellan Strait; the others arrived safely and were immediately outfitted and sent north to the Shumagin Islands for cod. In addition to handling his own fish he also continued to buy the cargoes from other vessels.

In 1873 a partner was taken into the business and the firm was then known as Thomas W. McCollam & Co. In 1874 the schooner *Alfred Adams* was added to his little fleet, while the *Flying Mist* went sea-otter hunting on the Asiatic shore.

In 1876 the firm again changed the location of its home curing station, removing to Pescada Landing, opposite Sausalito, on Richardsons Bay, where its successor, the Union Fish Co., still carries on the business. In 1883 several new members were admitted into the firm and its name changed to the McCollam Fishing & Trading Co.

The first shore fishing station for cod in Alaska was established by this firm at Pirate Cove, Popof Island, in the Shumagin Group, in 1876, a more detailed description of which will be found in the chapter devoted to the history of the shore fishing stations in Alaska.

In 1893 the Pacific Marine Supply Co. was organized in San Francisco for the purpose of engaging in cod fishing and the carrying on of other business. The first published record we have of the company engaging in cod fishing was in 1896, when the former whaling schooner *La Ninfa* (also given as *LaNympha*) was outfitted and sent to Bering Sea. In 1904 the name was changed to the Alaska Codfish Co., and the business has been operated under this name since. In addition to a fleet of vessels the company also owns and operates a number of shore stations in Alaska.

In 1898 a combination of several San Francisco firms operating in the cod fishery, notably the McCollam Fishing & Trading Co. and Lynde & Hough, was formed and the name Union Fish Co. was selected for the new company.

From the very beginning San Francisco has occupied the premier position in the fishery, in fact, for many years it was the only place on the coast where cod vessels were outfitted. The industry fluctuated much and the changes in the personnel were frequent. The late Mr. Charles P. Overton, for many years before his death connected with the Union Fish Co., and one of the brightest men engaged in the industry, has written considerable upon the early history of the San Francisco fleet, and the author quotes from his writings as follows:

> While making a review of the past years in the codfish business, probably the most interest would lie in recalling the names of those who have been prominently identified with the industry. Considering the few years that the business has been carried on and the restricted nature of it, the list is a surprisingly long one, and is one that should be published as a record to be preserved among the archives of the industry.
>
> First, there was Capt. Turner himself. Like most pioneers he did not make much of a financial success of it and soon abandoned it to others.
>
> Sometime previous to 1870 Miller & Hall, the hay merchants, sent the brig *I. B. Lunt* two or three times. The fish were sold by Lynde & Hough, but the returns did not pay cost and interest and they dropped out.
>
> Andrew Crawford, the ship chandler and Tahiti trader, had a schooner in the codfisheries previous to 1870. From 1870 to 1873 he operated the bark *Legal Tender*, Capt. Wentworth. At first there was a profit, but the last two years were so unfavorable that Crawford withdrew from codfishing and turned his entire attention to the South Sea trade.
>
> Donald Beadle was one of the prominent figures "on the front" in the early days having interests in the commission and shipping business, and in the old firm of Goodall & Perkins, and with Moss in some of the southern coast landings. Like everybody else on the front he had his turn at the codfish fever and was interested in the voyages of the *Bernice*, *Kinau*, and bark *Union*. At that time the fish were all cured direct ex-vessel and so many spoiled before they were sold that the losses were considerable.
>
> Capt. Wing, backed by the funds of his son-in-law, Bailey Sargent, of the American Exchange, bought the little bark *Domingo*, and the captain became a codfisher. With an occasional diversion to South Sea trading, he fished with more or less regularity for five or six years, Sargent backing the ventures until the captain died, practically of old age.

Col. C. L. Taylor dipped in as a venture about 33 years ago, and he still refers sadly to what it cost him for his experience.

In 1874 and again in 1876 a Capt. Jacobsen sent the little schooner *San Diego* to the Choumagin Island grounds under Capt. Wentworth. Two voyages were enough; then he sent her sealing. Explaining the change, he said: "Well, Capt. Wentworth is a goot mon, but he is too expensible."

James J. Laflin, or, as everybody "on the front" knew him, Jimmy Laflin, a sailor boarding-house keeper, who would furnish a crew for any vessel "and no questions asked," operated the schooner *Alaska* in the codfisheries during the seasons of 1876–1879. The first two years the cargoes arrived on a bare market and the profits were good—good enough to induce such an increased catch by him and others as swamped the market, and after the two years of good business and then two years of correspondingly bad business, Jimmy diverted his vessel into other trade, and she was finally lost in the Bering Sea bringing down a company of Alameda mining men from Golovin Bay.

Johnston & Veasey (1877–1879) were among the old-timers at it. They held on for three years. Veasey, later, drifted into a small produce business and died poor many years ago. Capt. Johnston got down to going to sea again on monthly wages and then drifted around the water front looking for a berth of some kind and finally disappeared.

Another of the old-timers (1879–1884) was John Molloy, the junk and second-hand man of Clay Street, with the old brig *Glencoe* in the codfish business as a side issue. Like everything else that old John had, the vessel was poor, the salt was poor, and the fish were, of course, yellow or sour, dried up or slimy, but they went onto the market and helped damn Pacific codfish. Old John had a brother-in-law, a wealthy wholesale grocer, who furnished checks to keep him going. When the brother-in-law withdrew his support, old John went around town, bought everything he thought his credit would stand, and quietly went into bankruptcy—paying nothing on the dollar. He is dead and doubtless gone to his just reward. Any unkindness I may feel toward old John may possibly be because we were on the list of creditors when the end came.

From 1882 to 1888 Ed. H. Hansen, of Wright & Bowne, and Capt. A. Anderson, now of the Lewis, Anderson, Foard Co., with some others, operated the schooner *Isabel*, Capt. Nickerson, in this business. For the first two or three years they caught the market short and did so well that they added the brig *W. H. Meyer*. But about this time the production began to exceed the demand, and they soon had to drop out the brig. Business became so poor they did not keep the old *Isabel* in good repair, and in the spring of 1888, while on her way to the fishing banks, she opened up somewhere out at sea. As many of the crew as could do so got into the dories, and after suffering many privations about half of them were rescued more nearly dead than alive. This ended the venture, and the partners paid up their losses and quit.

In 1883 Higgins & Collins, the wood and lumber men, with Wheeler Bros., small tugboat men, fitted out the schooner *Bonanza* on an eastern basis, importing eastern fishermen and eastern gear. They cured their fish on the deck of the vessel in Oakland Creek, and when they closed up their accounts each of the partners was an even $2,500 to the bad. That schooner *Bonanza* had an eventful and varied career. Built in 1875 as a yacht for William C. Ralston, the brilliant but unfortunate manager of the Bank of California, she has been freighter, trader, codfisherman, and finally as a whaler was crushed in the ice last year in the Arctic near Herschel Island. The story of her voyages to the remote and unfrequented waters of the North and South Pacific, the Behring Sea, and the Arctic Ocean would be worthy the pen of Robert Louis Stevenson.

In 1886 James Madison and some of his associates fitted out the schooner *Francis Alice*, and also started a little station at Ikatok in Alaska. The fish were offered on the street by Frank Bates, a broker, but the trade was filled up by the old companies, and the fish found such slow sale that the whole cargo was bought in by this company at a very low price. We later took over the station, and the schooner and the business was entirely closed out. Like a butterfly, it lived but one summer.

In 1894 a Capt. Jorgenson bought the condemned steamer *Salinas*, converted her into a three-masted schooner, rechristening her the *Uranus*, and sent her codfishing. He did fairly well for two years then, with the backing of the firms outfitting him, he added the *W. F. Harriman*, also a condemned hull refitted. At the end of the third year his whole outfit passed into the hands of those who had been backing him, and he was known in the codfish business no more.

Young Duggan (1902) had a short and inglorious career as a codfish man, and some of the money that his father made in the shirt business went to pay what it cost the young man to listen to the siren song of the wily promoter. The schooner *J. G. Wall* went to the Bering Sea under the joint command of Capt. Dollard (the promoter) and Henderson (an experienced codfisher). We bought their season's catch, and it lasted us just three days. One season was enough for Mr. Duggan.

Undoubtedly the most picturesque figure in the whole line was Nick Bichard. A native of the Isle of Jersey, a pioneer shipowner and merchant of San Francisco, he accumulated a fortune during the days of the Civil War and was early in the codfish business with quite a fleet of old vessels, both large and small, and for many years he was a prominent factor in the business. A large, swarthy man, erratic in speech and action, mixing codfish, coal, lumber, and junk, keeping most of his books in his head, he never knew what his cargoes cost him nor what they sold for. The codfish business absorbed more and more of his capital; then his real estate, two fine water lots on Stuart Street, the gore lot at California and Market Streets, and other property went the same way; the old vessels wore out and were lost and he finally died peacefully in the night of heart failure, leaving barely enough to bury him.

Chief among the old-timers and of those most largely interested and longest in the business was the firm of Lynde & Hough, two enterprising Yankees of the old school who started in Sacramento in pioneer days, came down to San Francisco, were in the commission business and, from selling codfish on commission, drifted into the cod-fishing business [in 1865] itself. They were for many years among the heaviest operators in codfish and, in addition, they dealt in all other kinds of salt fish, cornered the honey market, dipped into sealing in the Straits of Magellan, South Sea Island trading, fishing and trading stations in Alaska, salmon fishing, freighting, running a coasting passenger steamer, and anything else that promised a dollar, including "Okhotsk Sea Cod Liver Oil" and "Dr. Fisherman's Lotion for Man and Beast." They and their surviving partner, L. E. Noonan, were well and favorably known from Alaska to South America and from Hawaii to Australia and the Orient. Their last venture was codfish mixed with mining, and finally both of the senior partners died, leaving no money but various debts behind them. Their location at California City was sold to the United States Navy Department for a coaling station, and their vessels and cod-fishing business were merged into the Union Fish Co.

L. E. Noonan was connected with the Lynde & Hough company for nearly 40 years, at first as general factotum and handy-man-ready-for-anything. He ran the fish yard, outfitted the vessels, hired captains and crews, packed and repacked salmon and mackerel, bought and sold on the street. Later he acquired

> an interest in the firm and, being of a more thrifty disposition and not interested in the mining, he was enabled to retire with enough to permit him to take a well-earned rest.
>
> These epitaphs of those who have dropped into the business and then dropped out run in schools. Their course is something like this: The bright sun of prosperity shines for a season or two upon the regular stand-bys in the business and it looks very attractive and inviting to some chaps with an old vessel or a little spare money. So they jump in and for a time cut a brilliant dash in the business. So bright are they that the sun of prosperity is all in eclipse and everyone in the trade walks in shadow. When they get tired of this or broke they drop out, and those who are left pick up the scattered ends of the trade, struggle out into the light again, and by and by there is some more prosperity and then a new crop of hopeful investors appears, and so on and on.[a]

One of the most picturesque figures in the industry, and one who cut a wide swath while in it, was Edward Pond. Beginning in 1902, with apparently no end of money, he sent two vessels to Bering Sea. In 1905 his fleet had increased to three vessels, two of which fished in the Okhotsk and one in the Bering Sea. Prices for fish were low in 1906 and 1907, and when the two vessels he had sent to the Okhotsk Sea in the latter year returned virtually empty, having been driven from the sea by the Russian authorities, he was forced to the wall, and his stock of fish on hand and to arrive was taken over by the Union Fish Co.

In 1905 the Pacific States Trading Co. was organized at San Francisco. A home-curing station was built on Carquinez Strait, about 30 miles from San Francisco, and named Woodside Glen. The schooners *Glen* (121 tons) and *John F. Miller* (170 tons) were sent to Bering Sea. The company also built several shore stations in Alaska, as noted elsewhere. Later the company added the schooners *Ottillie Fjord* (247 tons) and the *Dora Bluhm* (315 tons) to its fishing fleet. On September 30, 1907, the schooner *Glen* was lost on Unimak Island, with the loss of one life. While the schooner *John F. Miller* was engaged in an attempt to salve the wrecked schooner a gale suddenly sprang up on January 8, 1908, and she was also driven ashore, 10 of her crew losing their lives. This disaster to two of its fleet, together with a heavy overproduction in 1908 causing a slump in the market, compelled the company to cease operations for a season or two. In 1909 the company's schooner *Ottillie Fjord* was outfitted and sent north by the Union Fish Co. In 1910 all operations were suspended, but in 1911 the company resumed operations at its shore station in Northwest Harbor, and also outfitted and sent north the schooner *Ottillie Fjord*, and operated continuously until early in 1916, when the company finally abandoned the business.

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[a] Pioneers in the Pacific Coast Codfish Industry, by C. P. Overton. Pacific Fisherman Annual, 1906, p. 70, 71, and 75.

For a number of years the majority of the San Francisco vessels resorted to the Okhotsk Sea for their cargoes of cod, and in some seasons nearly all of the vessel fishing was prosecuted there. In 1892 the Russian Government began to enforce a regulation imposing a license on all vessels fishing within 30 miles of shore, and from this time on the American vessels experienced alternate periods of harassment and quiet, according as the disposition of the Russian Governor was toward lax or rigorous enforcement of the regulation. A typical instance of such harassment is cited by Wilcox.[a]

> The three-mast schooner *Hera*, 369 net tonnage, of the San Francisco codfish fleet, was the only American vessel that fished in the Okhotsk Sea. Her catch was all made from 10 to 30 miles from the shore. While fishing, the vessel was boarded by a Russian officer, who ordered that fishing cease and that the vessel report at once to the governor of the district and there procure a license. The master of the *Hera* denied that he was fishing in waters of Russia, as he was fully 10 miles from shore. The officer threatened to seize the vessel if his order was not obeyed. The master complied, and on reporting to the governor again protested as to his having any legal right or authority to interfere with him when fishing so far from land, no fishing having been attempted under 10 miles from shore. As before, a protest was not recognized, and $1,000 in gold was demanded for a license that must be procured before the vessel would be permitted to leave the port. A compromise was made by the master giving, under protest, his personal order for $1,000 on the owners of the vessel at San Francisco. The vessel then returned to the fishing grounds, completed her cargo, and returned to San Francisco with a catch of 159,000 codfish, of a net weight of 685,140 pounds. The order given by the master was forwarded to the Russian consul at San Francisco for collection; but the draft having been given under compulsion its payment was refused.

In 1907 matters began to assume a serious aspect. That year the following vessels had visited the Okhotsk Sea: The schooner *John D. Spreckles*, the barkentines *Fremont*, *City of Papeete*, and *S. N. Castle*. Shortly after the vessels arrived and began fishing the Russian gunboat *Mandjur* appeared, and an officer boarded the *John D. Spreckles* and *S. N. Castle*. Taking their papers, the commander ordered the vessels to quit fishing, claiming they were within the 30-mile limit, and threatening to seize the vessels if they did not. As a result the vessels left the sea and returned to San Francisco almost empty.

A few days later, on June 12, the gunboat met and boarded the *Fremont* and seized her papers, also.

On June 19 the gunboat came alongside the *City of Papeete*, and the Russian commander seized her papers and ordered her to quit fishing. Capt. Stensland, the master of the *City of Papeete*, went aboard the Russian patrol boat and showed her commander a copy of an opinion written several years before by John Hay, while Secretary of State, to the effect that under international law the vessels of any nation had a right to fish at any point 3 miles or more offshore. In anticipation of just such a happening this copy had been furnished to the master by A. Greenebaum, president of the Alaska Codfish Co., owners of the vessel. Secretary Hay's opinion seemed to have considerable influence with the officer, who at once steamed to the mainland to seek advice from his superior officers. On July 10 he returned and restored the ship's papers to the master, admitting that the 30-mile limit for fishing was not to be enforced.

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[a] Notes on the Fisheries of the Pacific Coast in 1895, by W. A. Wilcox. Report of United States Commissioner of Fish and Fisheries for 1896, p. 634, 635. (1898.)

On July 12 the Russian gunboat steamed alongside the *Fremont* and restored not only her own papers but also those of the *John D. Spreckles* and *S. N. Castle.*

In 1908 a fleet of three vessels fished in the Okhotsk Sea, while in 1909 only the barkentine *Fremont* fished on these banks. The latter vessel's master reported a considerable fleet of Japanese vessels fishing there for cod. This was the last season in which American vessels visited the Okhotsk Sea for cod.

In 1891 Capt. J. A. Matheson, of Provincetown, Mass., who had been engaged in the Atlantic codfishery for a number of years, sent his schooner *Lizzie Colby* around the Horn, coming himself by rail and establishing himself at Anacortes, Wash., and sent his vessel to the Alaska banks, this being the first venture on the coast other than from San Francisco. In 1905 the schooner *Fanny Dutard* was added to his fleet. In 1906 the schooner *Lizzie Colby* dropped out. In 1908 the schooner *Harriet G.* was purchased and it and the *Fanny Dutard* sent north. In 1909 the same fleet was sent north, but in 1910 only the *Fanny Dutard* was outfitted. San Francisco parties, as noted elsewhere, purchased the plant and fleet in 1910, incorporated it as the Matheson Fisheries Co., and installed Capt. Matheson as manager. In 1912 he dropped out altogether, but late in 1914 purchased the fleet of the Matheson Fisheries Co.—the schooners *Azalea* and *Fanny Dutard*—and sent it north under his own name in 1915.

The Puget Sound & Alaska Commercial Co. was the pioneer in the cod fishing industry from Seattle, Wash. It began operations in February, 1892, and on March 5 dispatched the schooner *Moonlight*, of 68 tons, to the Bering Sea banks. The vessel returned on August 20 with 175,000 pounds of salt cod. No more is heard of the company after this first venture.

In 1896 Tracy H. Robertson organized the Oceanic Packing Co., with headquarters in Seattle, and outfitted and sent to Bering Sea the schooner *Emma F. Harriman.* She returned with a full cargo, but as the demand in the Northwest for cod was quite slack, the vessel was sent direct to San Francisco and the cargo sold there.

In 1897 the company sent to Bering Sea the brigantine *Blakeley* and the schooner *Swan*. The vessels returned with full cargoes, and these were prepared for market at a plant the company had built in West Seattle.

The Klondike rush had begun in 1897, and in 1898 the company became interested in the transportation business and diverted its vessels into this industry, in the course of which the schooner *Swan* was wrecked. In 1899 and 1900 the brigantine *Blakeley* was sent to the Bering Sea banks by the company, and returned each season with full cargoes. The business had not proved very profitable, however, and the company ceased operations in the latter year.

In 1898 Mr. Fay, a Seattle lawyer, sent the schooner *Lizzie S. Sorrenson* (89 tons) to Bering Sea. She returned with a full cargo and the fish were worked up at a plant built at Richmond Beach. The venture could not have been very profitable, as only the one trip was made. The *Lizzie S. Sorrenson* was a comparatively small schooner and her chief title to fame rests upon the unusual fate she eventually met. In 1909 the Tyee Co., which then operated a shore whaling station at Tyee, southeast Alaska, purchased the schooner, which was thereupon fitted with a gasoline engine and turned into a whaler. On May 10, 1910, a whale was sighted in the ocean about 8 miles southwest of Cape Addington. The vessel was cautiously worked to within gunshot and a harpoon driven into the animal. The weapon failed to reach a vital spot, and after an effort to escape the gigantic mammal turned suddenly, and charging the vessel, struck her full in the stern. The impact knocked out a portion of the vessel's bottom and she sank in a few minutes.

The Seattle-Alaska Fish Co. began business in Seattle in 1902, using for its home station the old West Seattle plant of the Oceanic Packing Co. The first year the schooner *Carrier Dove* was the only vessel outfitted, but in 1903 the schooner *Nellie Colman* was added. In 1906 the latter vessel was sold, her place being taken by the schooner *Maid of Orleans*. Only the *Carrier Dove* was outfitted in 1907, but in 1908 she was sold and the *Maid of Orleans* outfitted. In 1910 the company was absorbed by the King & Winge Codfish Co., of Seattle.

In 1904 the late Mr. W. F. Robinson, who had been connected with the New England fisheries for a number of years, and others bought the schooner *Alice* and, under the name of the Schooner Alice Co. (Inc.), sent her north. In 1905 the corporate name was changed to the Robinson Codfish Co., the schooner *Joseph Russ* purchased, and a large plant constructed at Anacortes, Wash. In 1911 the original plant was sold and another erected at once on the company's property in connection with a by-products plant which they owned. In 1912 the name of the company was changed to the Robinson Fisheries

Co. On April 20, 1912, the schooner *Joseph Russ* was lost on Chirikoff Island, Alaska. In 1914 the schooner *Wawona* was purchased and the same year she brought home the largest trip of cod, 240,000 fish weighing about 1,100,000 pounds, ever caught and landed from an American vessel. In 1915 she broke her 1914 record with a catch of 258,323 fish weighing approximately 1,150,000 pounds.

In 1904 the late Andrew Webber, of Seattle, made a venture in the industry by sending to Bering Sea the little schooner *Ida May*, and repeated it the next season, after which he withdrew.

In 1905 the King & Winge Codfish Co., composed principally of King & Winge, the well-known shipbuilders of Seattle, sent the schooner *Harold Blekum* (185 tons) to the Bering Sea banks, and continued doing so, adding the schooner *Vega* later, until 1910, when the company joined the consolidation known as the Western Codfish Co. The company had its home-curing station located in West Seattle.

The Blom Codfish Co. was organized in Tacoma in 1905 and sent the schooner *Falcon* (195 tons) north, in the meantime building its home-curing station at Quartermaster Harbor. The company had a very checkered career, finally ceasing business in 1914, when its assets, including the schooner *Fortuna*, passed into the hands of Seattle parties, who organized the Northern Codfish Co. for the purpose of carrying on the business. The latter company sent the vessel north in 1915, but dropped out of the business early in 1916, the schooner being chartered to the Pacific Coast Codfish Co.

The Pacific Coast Codfish Co. was formed in 1911 by former stockholders of the Seattle-Alaska Fish Co., which had been sold to the King & Winge Codfish Co. The company constructed a home-curing station at Poulsbo the same year, and sent north the schooner *John A.* In 1913 the schooner *Chas. R. Wilson* was added, and in 1914 the schooner *Maid of Orleans*, while in 1915 the schooner *Fortuna* was chartered and added to the fleet.

In 1910 T. Tilmann, jr., of the firm of Tilmann & Bendel, and other San Francisco parties, none of whom had heretofore been engaged in the business, attempted to form a consolidation of the Puget Sound companies. A controlling interest was secured in the King & Winge Codfish Co., and this company then purchased the Seattle-Alaska Fish Co. The two properties were then merged under the name of the Western Codfish Co. The property of Capt. J. A. Matheson was purchased and it was incorporated under the name of the Matheson Fisheries Co., with Capt. Matheson in charge of operations. In the meantime the Union Fish Co., of San Francisco purchased the cargoes of the schooners *Joseph Russ*, *Alice*, and *Fortuna*, the two former belonging to the Robinson Fisheries Co. and the latter to the Blom Codfish Co. The Western Codfish Co.

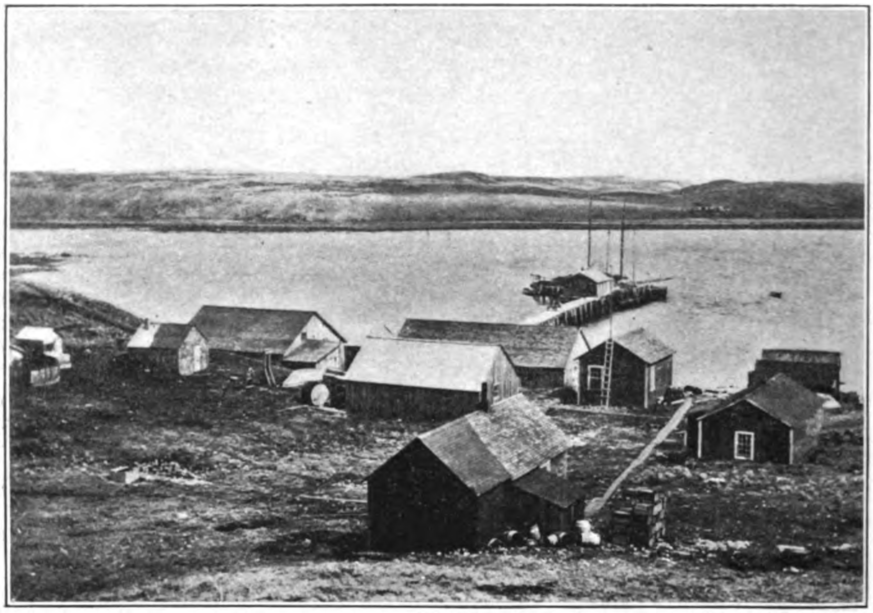

FIG. 1.—UNION FISH COMPANY'S PAVLOF STATION, SANNAK ISLAND, ALASKA.

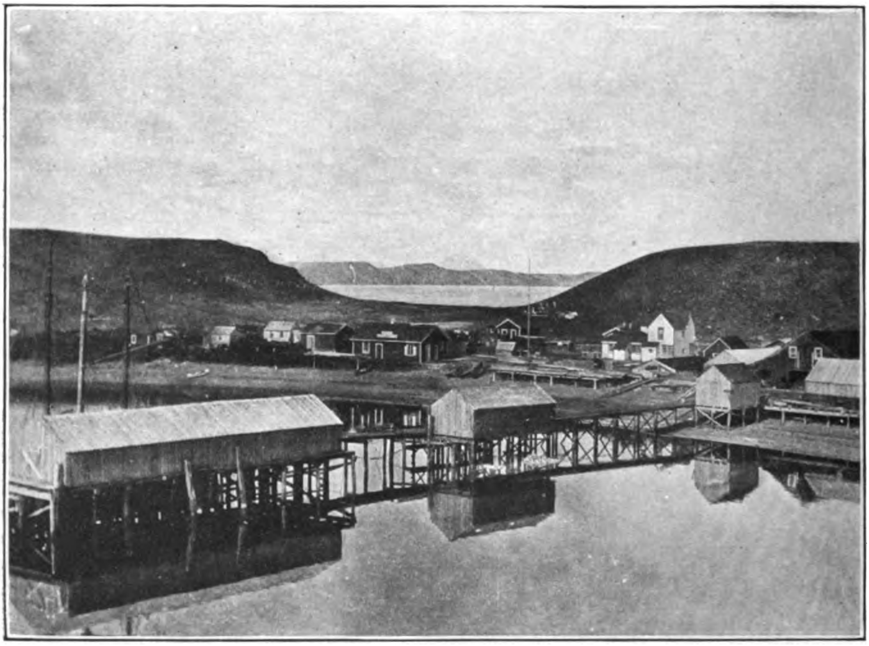

FIG. 2.—PIRATE COVE, THE PIONEER CODFISH STATION OF ALASKA.

had but a brief existence, dropping out of active fishing operations early in 1912, while in December, 1914, Capt. Matheson bought from the Matheson Fisheries Co. the schooners *Fanny Dutard* and *Azalea* and sent them north in 1915 under his own name. After disposing of its 1914 catch of cod the Matheson Fisheries Co. wound up its active career in the summer of 1915.

The first Canadian company to engage in cod fishing on the Pacific banks was the Western Canadian Fish Co. This company built a home station at Barnet, British Columbia, in 1903, and sent the brigantine *Blakeley* to Bering Sea. The company struggled along until the latter part of 1905, when it went out of the business.

In 1913 the Canadian Fish & Cold Storage Co., of Prince Rupert, British Columbia, outfitted the schooner *Albert Meyer* and sent her to the Bering Sea banks. She arrived there at almost the end of the fishing season, and as a result brought back but a few hundred fish. The vessel made another trip in 1914, when it met with fair success. As the market was very poor when she returned, the company gave up this branch of its business.

HISTORY OF ALASKA SHORE-FISHING STATIONS.

The natives living in the vicinity of the great cod banks of Alaska have depended upon them for a considerable part of their food supply, although not to such an important extent as they have upon the salmon. When the Russians came more and more home use was made of cod, and the same is true of their creole descendants to-day. With the exception of a few small shipments made from Kodiak in the early years of the industry, the catch of the natives and few whites living at other than the regular cod stations has all been consumed locally.

The late Thomas W. McCollam, of the McCollam Fishing & Trading Co., of San Francisco, was the first to perceive the advantages to be obtained from establishing stations close to the cod banks, where the fishermen could go out daily in dories to the adjacent banks and the catch be stored ashore until a cargo accumulated, when a vessel could be sent north to bring them to San Francisco.

Early in the seventies a party of hunters had established a station at Pirate Cove, a very pretty and well-sheltered cove, with ample depth of water, at the north end of Popof Island, one of the Shumagin Group. A wharf and several buildings had been constructed by the party. Mr. McCollam purchased this station and established here the first regular shore fishing station for cod in Alaska.

An agent and about eight fishermen were stationed here during the early years of its existence. At first the fish were all kenched, but later on tanks were sent up and the fish held in pickle until shipped.

The station gradually increased in size and importance, and to-day, as well as in the past, is the largest and most important one in Alaska.

In 1886 a branch fishing station was established on Pavlof Harbor, Sannak Island. In 1890 a station was opened at Kasatska, on the south side of Sannak Island, and was operated for several years, finally being abandoned because of the dangerous navigation for sailing vessels on that shore. The Port Stanley, Sannak Island, station was established in 1891, but was abandoned a few years later. All of these were what are known as "winter stations," that is, stations operated in what are known as the winter months in Alaska; during the rest of the year the fish are too far out in the deep water for fishing with dories with the shore as the base.

In 1892 a station was established on Sanborn Harbor, Nagai Island, Shumagin Group, and this has been operated almost continuously ever since. Fishing is carried on here from the middle of spring to late summer.

In 1883 Ivan Petroff built a fishing station on Sitkalidak Island, close to the Indian village at Old Harbor, on the channel separating Sitkalidak from Kadiak Island, where for a time considerable quantities of cod were cured and shipped to San Francisco.

In 1886 James Madison and associates, of San Francisco, fitted out the schooner *Francis Alice*, and also started a small station at Ikatak, on Unimak Island. The venture lived but one season, the station then being taken over by the McCollam Fishing & Trading Co.

Lynde & Hough, a well-known San Francisco firm, early entered the codfish industry and for a number of years were important factors in it. Besides a fleet of vessels the firm established a number of shore stations in Alaska. The earliest of their stations was at Sand Point, on Humboldt Harbor, Popof Island, in the Shumagin Group. This was in 1887. It was established principally as a trading and salmon fishing station, its relation to the codfish industry being mainly as a supply station where the firm's vessels could land their cargoes and refit for another trip without having to return to the home port for this purpose.

The firm built a number of shore stations shortly after this—Unga Harbor (1888 or 1889) and Squaw Harbor (1889), on Unga Island; Henderson Island (1889), in the Shumagin Group; Company Harbor (1889) and Nelson Island (1890), in the Sannak Islands; Chicago Bay (1890), Alaska Peninsula, and Ikatak (1890), on Unimak Island. Several of these had but an ephemeral existence, as Chicago Bay, Nelson Island, and Henderson Island.

About 1898 the McCollam Fishing & Trading Co. and Lynde & Hough formed the Union Fish Co. as a selling agency for their product. It was not until 1902 or 1903, however, after the death of both Lynde and Hough, that the two concerns were finally merged into one and the whole business operated under the name of the Union Fish Co.

In 1876 Mr. A. Greenebaum, then and for a number of years subsequent, agent for the Alaska Commercial Co., built a trading station for the company at Acherk Harbor (later known as Company Harbor) on Sannak Island. A little codfishing was prosecuted at times, but it was not until 1896, when it became the property of the progenitors of the Alaska Codfish Co., that it was used for this business exclusively. In 1897 the company established another station on Moffet Cove, a few miles east of Company Harbor.

In 1896 the Alaska Codfish Co. opened its Kelleys Rock station, situated about midway between Unga and Squaw Harbors. This, like the Unga station, is an all-the-year-round station and is by far the most productive one owned by the company.

In 1906 the Alaska Codfish Co. bought the Alaska Commercial Co.'s station at the town of Unga, on Unga Island, and began fishing operations in the fall. The next year the Union Fish Co. built a station here, but on the opposite side of the harbor. Fishing is carried on here throughout the year.

The present Squaw Harbor station of the Alaska Codfish Co. was first established as a salmon saltery by a man named Olsen, who also utilized it at times as a codfish station. In the summer of 1903 the present owners purchased it and have very much improved it since. It is a winter station. Its principal use to the company is as a supply depot for its near-by stations, the harbor being one of the safest in the Shumagins.

The Dora Harbor, Unimak Island, stations of the Alaska Codfish Co. and the Union Fish Co. were established in 1897 and 1898, respectively. While they were quite productive the first two seasons, they have been steadily diminishing in importance ever since. The Sannak Island station men are transferred to these stations in the spring, after the cod have moved off into the deep water surrounding Sannak Island, and are brought back again in the fall when the fish have again returned to the shoal waters.

About 1903 the Union Fish Co. built a station at Wedge Cape, Nagai Island, and operated it intermittently as a summer station until 1909, when it was abandoned.

In 1903 the Union Fish Co. built a station at Eagle Harbor, on Nagai Island, and operated it continuously up to and including 1909, since when it has been shut down owing to the difficulty of securing enough men to work it.

The first Puget Sound company to establish a shore station in Alaska was the Seattle & Alaska Fish Co., of Seattle, which built a station at Falmouth Harbor, on Nagai Island, in the spring of 1903.

As this proved to be too far from the fishing grounds, the station was moved almost immediately to Squaw Harbor, on Unga Island. In place of the dories used at other stations, this company equipped the plant with Columbia River boats, two to four men going in each. The station was worked intermittently until 1910, when the company sold out to the King & Winge Codfish Co., which ultimately merged into the Western Codfish Co. It has not been operated since, owing mainly to its remoteness from the fishing grounds. It is now the property of John H. Nelson.

In the fall of 1902, John H. Nelson and John Einmo opened a shore station at Hard Scratch, on Snug Harbor, Unga Island, but operated it only one winter. In the fall of 1911 R. H. Johnson established a shore station here and has operated it ever since.

In the fall of 1905 the Blom Codfish Co., of Tacoma, Wash., built a station on the north shore of Eagle Harbor, Nagai Island, and operated it for a couple of years, when it was abandoned.

In the fall of 1905 the Pacific States Trading Co., of San Francisco, which had just recently started in business, established stations on Herendeen Island, Northwest Harbor, and at Ikatak, or Unimak Island, and operated them continuously until 1909. The latter station was not reopened, but operations were resumed at the former in the fall of 1911, and it was operated until early in 1916, when the company suspended operations and sold the station to the Union Fish Co. The Ikatak was a summer station, while the one at Northwest Harbor is a winter station.

In the summer of 1908 John H. Nelson, who had opened a station at Hard Scratch in 1902, started a station on Squaw Harbor and has operated it every year since. In the earlier years of its existence stockfish formed the bulk of the product, but during the last two years considerable dried salt cod has been prepared.

In 1914 A. Komedal, a merchant of Unga, established a station near that town and has operated it during the greater part of the time since.

In 1910 the Alaska Commercial Co. shipped to San Francisco aboard one of its regular trading vessels about 90 tons of cod which had been caught and cured by the natives of Kodiak. The fish proved to be quite small, and the company had so much difficulty in disposing of them that it did not repeat the experiment.

One of the heaviest handicaps under which Alaska station owners suffered for a number of years was the presence of saloons in close proximity to the more important stations. In 1913 there was one saloon at Sand Point (about 6 miles overland from Pirate Cove and about the same distance by water from four stations on Unga Island) and two at Unga; at and within a radius of 4 miles by land from the latter town are six shore stations. As a result of the close proximity

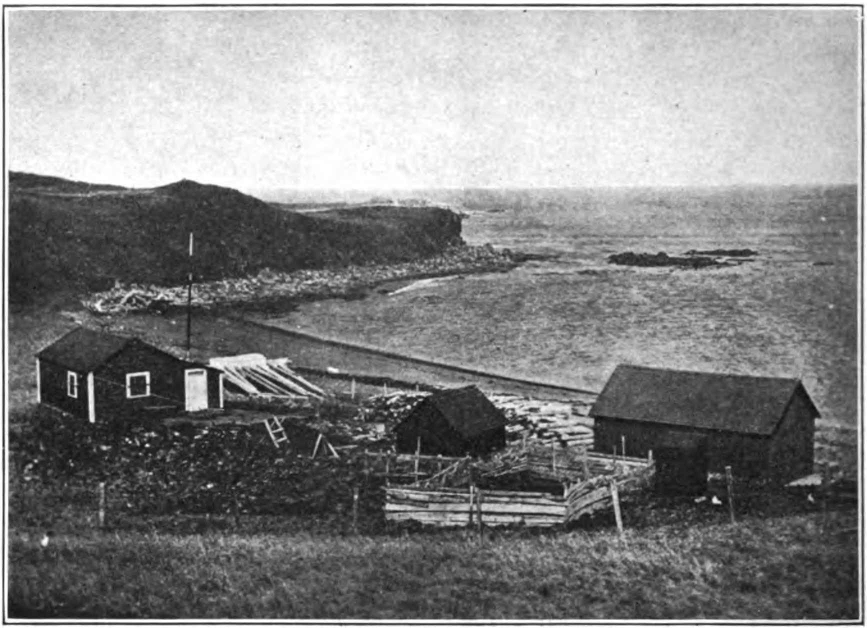

FIG. 1.—A COD FISHERMAN'S HOME ON SANNAK ISLAND, ALASKA.

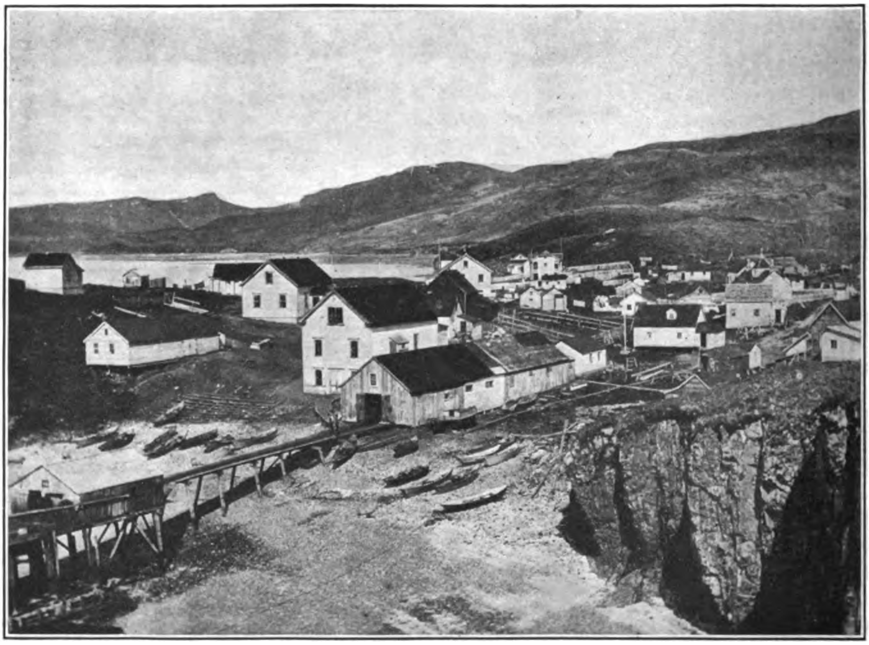

FIG. 2.—THE TOWN OF UNGA, ALASKA, WITH THE ALASKA CODFISH COMPANY'S STATION IN THE FOREGROUND.

of the saloons to the stations it was a very easy matter for the men to get hold of all the liquor they wished, and carouses were frequent, lasting sometimes for weeks, as fresh supplies of liquor were continually coming in. Frequently, also, a fisherman would meet with an untimely end through the capsizing of his dory while returning in an intoxicated condition from a visit to one of these saloons, or be frozen to death or meet with a fatal fall while traversing the rough and slightly marked trails between the stations and the towns. In 1914 the judicial authorities of the third district, in which the codfish industry is carried on, refused to renew the old licenses or grant any new ones, with the result that the district is now totally free of the legalized traffic at least.

PERSONS EMPLOYED.

With the exception of the owners, a few of the higher officials ashore, and several of the captains but a small fraction of those engaged in the industry are native-born Americans. The large majority are of Scandinavian birth, with a few Finns, Germans, Canadians, etc. At the stations quite a few natives are employed as fishermen. No Orientals are employed except as cooks at the stations.

The captains and mates of the vessels are almost all men who have worked up from the ranks of the fishermen. Operating on the codfish banks of Alaska requires considerable local knowledge of the banks, of the prevailing winds, and also of the most convenient spots for shelter and for water. While the majority of them are good navigators, a few are sadly deficient in this respect, yet their knowledge of Alaska conditions enables them to make about as many successful trips as their fellows who are better grounded in the science.

The men in charge of the stations are generally fishermen who have worked up from the ranks. While some of these men are excellent workers, with considerable native shrewdness, yet as the necessities of the industry require their constant presence in Alaska, they get very little opportunity to keep in touch with the world's progress, and generally continue throughout their business life to carry on business in the same old groove in which it was running at the time responsibility fell upon them. They are also a very poorly remunerated class of men, with practically no opportunity for advancement beyond the position of station agent. This largely explains why the codfish industry of the Pacific coast is but little further advanced to-day, so far as methods of catching and curing the fish are concerned, than it was 40 years ago.

While a small proportion of the white men are excellent fishermen of the type required for hand-line fishing from dories, the majority of them are ordinary beach combers picked up on the water fronts of San Francisco and Seattle, or men of practically no acquaintance with the sea even, let alone any fishing knowledge. The reason for this is that the salmon and halibut fisheries offer more congenial employment to the more intelligent and progressive of the fishermen. At the end of the salmon season in Alaska quite a few of the better class go to the shore stations and work there until the opening of the salmon season the following spring, when they take up the salmon work once more.

The natives generally are among the best of the station fishermen, as they are usually well acquainted with the locations of the many isolated spots which, while rich in cod, yet cover sometimes but a few feet or yards in extent and are difficult to find without certain landmarks being well fixed in the mind. They are persistent and skillful fishermen and generally are among the high-line fishermen unless handicapped through age, disease, or bodily infirmity. They are very apt to quit when the whim seizes them, but the author's experience with cod fishermen generally is that both whites and natives are apt to quit on very slight or no provocation at all, the desire for a change of scene at frequent intervals seeming, in their eyes at least, to be one of the essentials of the industry.

Quite a few of the white fishermen have married squaws, and for their accommodation the companies generally have small cottages or shacks scattered over the station grounds.

The use of nicknames by fishermen in order to distinguish each other is very common, and in many instances it is difficult to find out the real name of a man without having recourse to the station or ship records, and even here the records frequently show the nickname as part of his cognomen. These nicknames are derived in various ways, some being based upon the personal appearance or habits of the person so designated, while others are due to some incident connected with his life, still others to his place of birth, etc. Some are complimentary, while others are the reverse. Among the more prominent may be mentioned "Whiskey Jack," "Whiskey Bill" (in the first instance the excessive indulgence in this fluid led to the imposition of the name, while in the latter instance constant preaching of the merits of temperance caused it), "Dirty Dick," "Gentleman Gust," "Growling Pete," "Gloomy Gus," "Halibut Pete," "Northwest Bill," "Rolling Gus," "Redwood Gus," "Russian Bill," "Contrary Gus," "Stavanger," etc.

VESSELS AND BOATS.

Fishing vessels.—Unlike the vessels used in the New England fisheries, there is no distinctive type employed in the Pacific cod fishery. Not a single vessel now used exclusively in fishing was built especially for the purpose. All of them were at one time brigs,

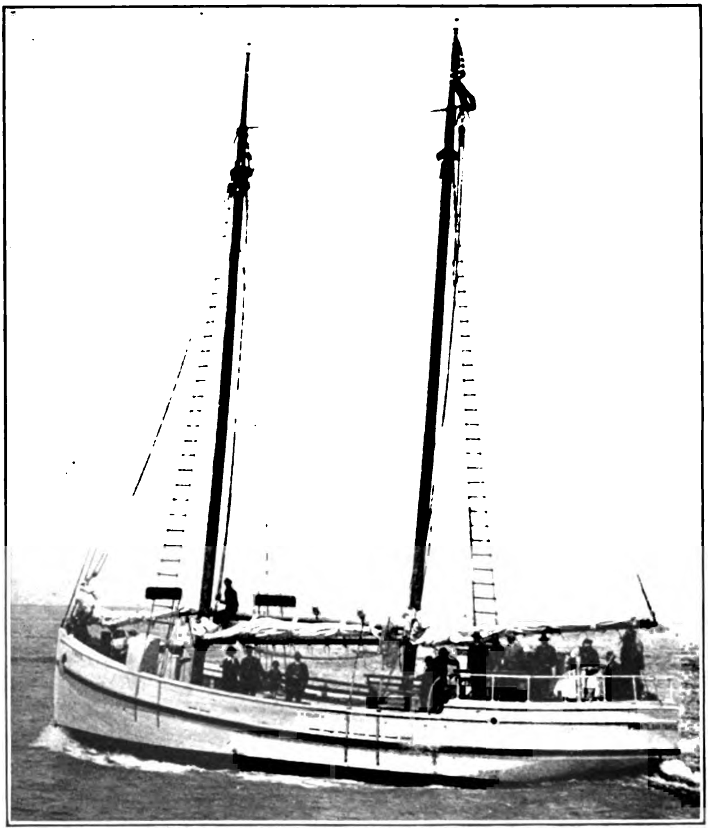

FIG. 1.—UNION FISH COMPANY'S SCHOONER "PIRATE," ALASKA STATION, FISHING AND WORKING BOAT.

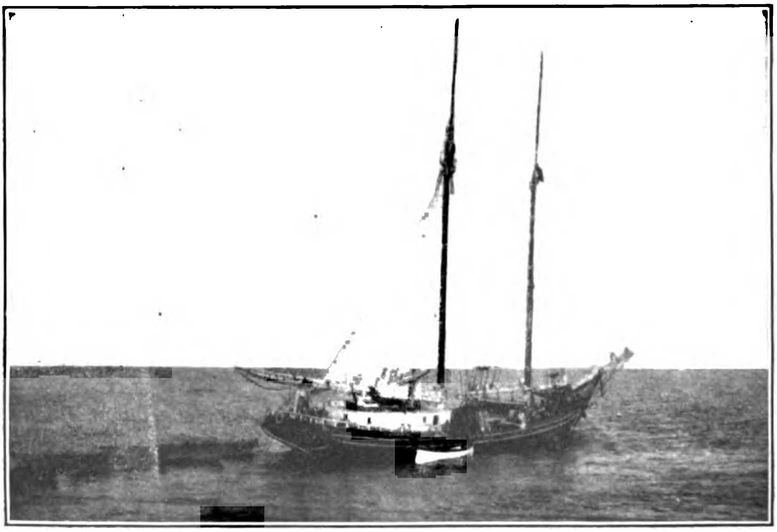

FIG. 2.—SCHOONER "MAID OF ORLEANS" AT ANCHOR ON SANNAK BANK IN THE NORTH PACIFIC OCEAN.

barks, barkentines, and schooners employed in the carrying trade of the Pacific and purchased for use in the fishery after they had attained varying ages. As the schooner rig has proven the most economical the vessels have gradually been altered until all are now of this rig. They vary in length from 102 feet 6 inches to 156 feet, and the net tonnage ranges from 138 to 413.

In Alaska a different type of vessel has been evolved. As the companies owning several stations frequently desired to transport goods and fish from station to station, small sailing vessels were employed in the early days. These were equipped with large cargo capacity and were vessels which had previously been used in California waters for various purposes. As the trips of these vessels were necessarily uncertain, owing to their dependence upon sails alone, it was soon seen that power vessels would be more profitable, and about 10 years ago the first vessels of this type were sent up under sail. In order to make them suitable for navigation under the trying conditions prevailing in this section of Alaska they were greatly altered, but even then proved far from satisfactory.

In 1912 the Union Fish Co., of San Francisco, had built on Puget Sound the first power vessel constructed to be devoted exclusively to the codfish industry. It was a schooner-rigged vessel and named the *Union Jack.* The vessel was 85 feet long, 18 feet beam, with a net tonnage of 39 tons. She was fitted with an 80-horsepower gasoline engine. As the owners had in view the using of this vessel part of the year in fishing also, they tried to adapt her for both purposes, with the result that she proved somewhat unsatisfactory for either, and was sold in 1913.

In 1914 the same company built another power vessel, the *Pirate,* to replace her. She is a two-masted schooner with knockabout rig and has a length over all of 64 feet 6 inches and a breadth of 21 feet. The hold is 6 feet 10 inches deep and 23 feet long, which provides a carrying capacity of 100 tons. The after cabin has accommodations for the captain and two men. The galley and mess room are also located here. The forecastle provides sleeping quarters for six men. The engine room is just forward of the pilot house, from which the main engine is controlled, thus permitting the captain to operate the engine as well as the vessel. The propelling machinery consists of an 80-horsepower engine, while a 9-horsepower windlass is used for handling cargo. It is the company's purpose to use this vessel in fishing during the summer months and in freighting in local waters the rest of the year.

Transporting vessels.—For a number of years the companies operating shore stations in Alaska have been utilizing vessels of the same type and size in fishing as in taking cargoes of supplies north to the stations and in bringing back the fish caught by the station fishermen. Frequently the regular fishing vessels would be, and are still, sent north on this work during the winter season. As stormy weather with plenty of fog is the rule in the North Pacific Ocean, many of these vessels have met with an untimely end on the inhospitable shores in this region.

In 1913 the Union Fish Co., of San Francisco, had built a power schooner for this work. This vessel, which was named the *Golden State*, has a length of 145 feet, a breadth of 32 feet, and a depth of 11 feet 6 inches, and in addition to her engines is fully rigged as a three-masted baldheaded schooner. She has a carrying capacity of more than 500 tons.

The propelling machinery consists of a 150-horsepower four-cylinder distillate engine. It is connected to a two-bladed propeller through a disk clutch and spur-gear type of reverse. The two-bladed propeller is used in order that the blades may be placed in a vertical position when the sails are being used, and in this way the drag of an idle propeller is eliminated to a large extent. The engine is so equipped that it can be handled at slow speed with the ease characteristic of a steam installation.

The vessel has also a complete electric lighting plant with dynamo and two sets of bilge pumps and a force or fire pump, all run off a countershaft, which is in turn run either from the main engine or, when that is not running, is driven by a 4-horsepower single-cylinder engine installed in the engine room. Besides the quarters for its crew of 8 men, the vessel has cabin accommodations for 10 passengers.

Boats.—A considerable proportion of the dories in use with the fishing vessels and at the shore stations in Alaska were manufactured in New England and brought to this coast overland. A few of the coast boat builders are now manufacturing them after the eastern model. The hand-line dories are usually 14 feet long, bottom measurement. Occasionally trawl lines are employed, in which event larger dories must be used in order to accommodate the additional man needed and the extra amount of gear required. These large dories are usually 15 feet in length on the bottom.

A few years ago one of the companies began the use of line trawls at its shore station and employed round-bottomed sailboats of the well-known Columbia River type in working them. The trawling experiment was soon abandoned and the boats either sold or put to other uses.

During the season of 1914 the schooner *Fortuna* took north with her 12 portable engines suitable for attachment to the regular dories. These were sold to the fishermen and were to be paid for out of the season's catch. The use of these engines did not prove satisfactory for a number of reasons, viz: The men generally knew nothing about their operation and care and grossly neglected them; the weight of the motor cut down the number of fish the dory could carry, while in rough weather, with the motor going and a load of fish aboard, the dory would ship heavy seas.

Small gasoline launches are beginning to be a factor in the Alaska station fishing. Some of these are dories, some Columbia River type of boats, while others are of nondescript types. Gasoline engines ranging from 2 to 12 horsepower have been installed in them. The chief disadvantage in the use of these is that the regular hand-line fishermen operating from dories refuse generally to permit the operators of these power boats to join with them in dressing the catch, and as a result they have to have a separate dress house, and unless there are enough of them to form a regular dress gang they find the business of dressing the fish rather laborious. Two or more men generally go in the power boats, and as they are enabled to go with perfect safety to the outer and less-worked banks, their daily catch is much larger proportionately than that of the regular hand-liners. The use of power also gives them a considerable advantage over the regular dory men, as they can go out in weather which would compel the sail and row dory to remain in port, and can go much farther away from the station and be sure of being able to get back again.

The number of these boats is increasing yearly, and it is to be hoped that they will continue to increase, as the owners of them are amongst the most industrious of the fishermen—men who do not waste all they make in riotous living, as is the custom with the vast majority of the fishermen. The larger companies have never encouraged the use of power boats, as they feared that in time the men operating them would become too independent and eventually become station owners themselves.

Nearly every hand-line fisherman carries a sail in his dory. The mainsail is usually of the leg-of-mutton variety. Some have a jib, while a few also use a staysail. The sails are generally made from sheeting, which is much lighter than canvas. Fishermen are expected to furnish their own sails, together with the necessary mast and boom. For a number of years the companies furnished the men with these articles, but so many of them failed to turn them in when paid off that they had to abandon the practice.

LAY OF THE CREW.

The methods followed in handling the catch and the lay of the crew are radically different from those on the Atlantic cod vessels. On eastern vessels the men catch and dress the fish and divide their share of the proceeds equally. On Pacific vessels the fishermen have nothing to do with dressing the fish, this being done by one or two dress gangs (the number depending upon the size of the vessel), the members of which are paid monthly wages, which begin the moment they are signed on and ceases when the vessel returns to her home port. The fishermen are paid a certain sum (this varying with each man's known ability as a fisherman) per thousand fish. This price varies from $25 to $45 per thousand. Fish 28 inches and more in length are count fish; all under 28 inches in length count two for one. All fish must be bled by having their throats cut as soon as caught.

Under this arrangement the fishermen devote their entire working time to fishing, returning to the vessel only when a dory load has been obtained. In this way some of the fishermen will catch several hundred fish a day when good weather prevails. As hand lining is almost universally employed but one man goes in a dory.

A dress gang is composed of a splitter, header, throater, salter, a man to remove the black skin, and from one to three others, called "idlers," who pew the fish as may be needed. When two gangs are operating some of the idlers do double duty and thus reduce the total number in the dress gangs. All members of the dress gang, and the cook, are encouraged to fish over the rail of the vessel, when not otherwise engaged, and for all fish so caught are paid the same sum per thousand as the majority of the fishermen receive.

The owners of the vessels furnish all provisions, fishing gear, boats, and the bait taken along from the home port, the members of the crew not being required to furnish anything other than their clothing and bedding.

The captains of Puget Sound cod vessels receive as their lay from $3 to $3.75 (about $3.50 being the average) per ton for the fish brought home. On the San Francisco vessels the captains are generally engaged by the year and are paid a salary of about $150 per month.

The following represent the average monthly union wages paid the various members of the dress gangs: First salter, $90; second salter, $75; head splitter, $100; second splitter, $85; header, $35; throater, $35; idlers, $30; salt passer, $30; cook, $100; and cook's helper, $30. This scale of wages was fixed by the fishermen's union early in 1916 and is now in force.

The great increase which has occurred of recent years in the returns received by the more important members of the crew is well exemplified when it is stated that in 1895 fishermen received $25 per thousand fish; one salter, $65 per month; one splitter, $60; one cook, $55; four men to throat, head, and do the other dress work, $25 each per month.

The following table shows the gross returns received by the two high-line fishermen of the principal vessels of the fleet, also the total wages received by the splitter and salter of each vessel during the season of 1913. The high-line man on the *Chas. R. Wilson* received the largest amount of money paid to the individual fishermen, $753.05. The season of 1913 was not an exceptional one for this man, as he has exceeded this sum several times during the last 10 years, and it would be a difficult matter to find a cod fisherman operating in eastern waters who earned as high an average return for a series of years as has this man. Of the dress gangs, the splitter of the *Vega* received the largest amount in wages, $633.55. The second splitter on the same vessel received exactly the same amount as the first splitter. Both were former Gloucester fishermen, and the season just closed here was the first for each of them.

Schooner.	First fisherman.	Second fisherman.	Splitter.	Salter.
John A.	$428.10	$388.88	$550.55	$542.21
Chas. R. Wilson	753.05	464.16	581.81	600.71
Alice	337.60	325.46	540.00	513.00
Maid of Orleans	580.00	556.00	560.00	500.00
Fanny Dutard	666.00	590.00	550.00	550.00
Vega	362.70	332.30	633.55	522.15
Galilee	352.15	342.80	584.05	562.70
W. H. Dimond	585.31	420.96	456.00	258.40
City of Papette	419.32	415.68	485.46	276.28

During the season of 1915 hand lines were used exclusively in fishing, but trawl lines, gill nets, and beam trawls have been used occasionally.

The hand lines are of special hard laid no. 72 untarred cotton seine twine. These are 7-pound cotton lines; i. e., one dozen 25-fathom lines weigh 7 pounds. Two to three of these lines are required to make one single fishing line, and each fisherman operates at least two fishing lines. Each line is generally fitted with a spreader, to which are attached two snoods. The hooks in general use are the no. 8 eyed japanned "Gravitation" and the no. 7 "Baylies." Most of the fishermen file down the long sharp point on the former hook. The leads weigh 5 pounds. No. 2 swivels are used in attaching the snoods.

Unlike his east coast brother, the Pacific cod fisherman worries but little about bait. Before sailing enough herring are taken along for a couple of days' baiting, but the fisherman usually gets enough shack fish the first day to furnish him with plenty of bait for the next day, and so on throughout the season. Sculpins, halibut, porgies, octopus, salmon, etc., form the principal sources of bait supply. In baiting the hooks the fish are slivered, steaks being cut from each side of the backbone. These are cut into three-cornered or square pieces, and are strung upon the hooks to the number of six to eight. Octopus is the favorite bait, a boat load of fish frequently being secured with pieces cut from one tentacle of this mollusk. Although clams are abundant in Alaska, the fishermen rarely ever bother to dig them for bait.

SEASON, METHODS, ETC.

The vessels generally leave their home ports between the middle of March and the middle of April, and arrive in the neighborhood of the Shumagin Islands, in the North Pacific, in from two to three weeks after sailing. The Shumagin Islands are approximately 1,553 nautical miles from Seattle and approximately 1,903 nautical miles from San Francisco.

As there is floating ice on the cod banks in Bering Sea at this time, most of the vessels fish off the southern side of Unimak Island. The early part of May some of the vessels move over to the southeast point of Sannak Island and spend the greater part of the season on the Sannak Bank, but the majority of them go into Bering Sea, where fishing is usually begun in Dublin Bay and on Slime Bank. Toward the latter part of June the Bering Sea fleet begins to work north onto Baird Bank, moving along by Port Moller and up as far as the mouth of the Ugashik River and occasionally, but not often, up into Bristol Bay proper.

The vessels which fish exclusively in the North Pacific Ocean sometimes spend the early part of the season on Shumagin Bank, working later on the Sannak Bank. A few start fishing at Cape Pankof, off the southern side of Unimak Island, as stated above, and work thence onto Sannak Bank, where they finish the season.

One great advantage the Pacific fisherman has over his Atlantic brother is that he does not lose any time because of enemies of the cod driving them off the banks, as is the case in the East, where vessels are sometimes tied up for weeks on account of dogfish. While the dogfish is to be found in Alaska waters, it is not in sufficient abundance to become a pest.

All Pacific codfishing is done in the daytime. Owing to the high latitude of the banks and the fact that the vessel fishing season is the summer time, when the hours of daylight are most numerous, the hours of darkness rarely exceed four and are even less during June and July.

Early in the morning the dories are put over the sides of the vessel, which has been anchored in a favorable spot. Each dory is equipped with the necessary fishing lines, a small sail, a water beaker, a windlass for hauling in the anchor, a 10 or 14 pound anchor, a small keg buoy, a knife for cutting bait and bleeding the fish, a gaff for handling the large fish and with which most of the fishermen stun or kill the fish by striking it on the head with the handle.

But one man goes in a dory, and each rows away in search of a good place to fish. The direction in which they row from the vessel is, to a great extent, governed by the tide and force of the wind, the idea being to utilize the wind and tide to help in getting back to the ship when the dory, being full, would make rowing laborious. As the fish seem at times to be quite numerous in small, isolated areas, considerable luck enters into the fishing. When one of the fishermen is perceived to have good success his mates are apt to gather around and try their luck on the same spot. The men return to the vessel about noon, or sooner if a dory load has been obtained. After obtaining their dinner they go out again, and sometimes a trip will be made after supper. Each man's catch is counted as he pews them inboard upon his return to the vessels.

While the fishermen are out on their first trip of the day the members of the dress gang are usually fishing over the rail of the vessel, and some of them do this whenever they have a few spare moments. These men are paid a fixed sum (usually an average of the prices paid the fishermen) for all fish so caught, which is in addition to their regular wages.

Trawl lines.—But little trawling has ever been done by the vessels fishing on the Alaska banks, and none by those fishing on the Okhotsk banks. In 1888 the schooner *Arago*, belonging to Lynde & Hough, of San Francisco, employed trawl lines on the Bering Sea banks, but the fishermen claimed that the fleas (amphipod crustaceans) devoured or injured the cod so badly that their use had to be abandoned.

But few efforts in this line were made by the vessels of the fleet until in 1913, when the schooner *Vega* and the power schooner *Union Jack*, belonging to the Union Fish Co., of San Francisco, used trawl lines for a considerable part of the season. On the *Vega*, which fished on the outer banks off the Shumagin Islands, the ground line of the trawl was of 20-pound tarred cotton. The gangings, which were about 3 feet in length and set about 6 feet apart, were of 6-pound tarred cotton. The hooks used were of the 10/O japanned Limerick brand. The trawls were coiled in tubs made by sawing barrels into equal halves. Each dory crew was expected to have rigged up 42 trawls of 50 fathoms each, but under ordinary conditions would rarely ever have in the water at one time more than 14, one-half of the balance being baited and ready for use, while the rest were held in reserve in case of emergencies.

Around the edges of the top of the cabin of the vessel were nailed boards. When ready for the first baiting the fishermen dumped the bait onto the top of the cabin and then stood in the gangways and cut up the bait on the boards, and as fast as the hooks were baited the line was carefully coiled in a tub with the baited hooks in the center of the coil. Only one piece of bait, and that not a large one, is put on a hook.

The buoy line used was of 6-thread manila. At the surface the ends were marked by 10-gallon buoy kegs, painted red, and attached to the buoy line by swivels similar to those used for this purpose by the halibut fishermen. On rough bottom the ground line would be buoyed up by glass balls attached at intervals. Twelve or fourteen pound anchors were attached at each end of the trawl.

In the bow of each dory was fixed a roller working on a pivot, over which the ground line was hauled, in order to facilitate bringing it in. There are always two men in a dory when a vessel is trawling, one man to haul the line and shake the fish off, which he does by a dexterous twist of the wrist, while the second man baits the hooks and coils the gear in the tubs again. The men usually brought the trawl in when returning with the catch, but sometimes when the weather looked propitious the line would be underrun, the fish removed and new bait substituted, and allowed to fish again while the men took their catch aboard. Sometimes the trawl would be set out late in the evening and allowed to remain down until the men went out early in the morning.

The trawls were handled in the same manner as on the Atlantic coast. In setting a trawl two men go in a dory, one to throw the trawl and the other to row the boat. Having arrived at the place where the set is to be made, a buoy is fastened to one end of the buoy line and thrown over the side, the buoy line allowed to run out until the end is reached, when it, together with the upper end of the trawl line, is bent to the ring of the anchor. The anchor is then lowered over the side, and the trawl thrown from the tub until the lower end is reached; it is then fastened to the upper end of the second tub of trawl, and so on until all of the tubs—two, three, or more—have been set. The last end of the trawl, together with the second buoy line, is bent to an anchor and thrown over the side, care being taken to prevent the buoy line from fouling with hooks of the trawl as it is thrown out. To the free end of the buoy line is attached the second buoy. The method of "underrunning" a trawl permits the removal of the fish from the hooks and rebaiting them in a single operation, thus saving a considerable amount of labor. "Underrunning" is sometimes performed on ground where fish are plentiful and the weather is suitable for such operation. A trawl intended to be "underrun" is set in the usual manner with slight variation. A becket is made in the buoy line about 10 or 12 fathoms below the buoy. In the becket is bent a small line which reaches to the bottom, and to the bottom end of this line is fastened a stone weighing about 6 pounds. The ground line of the trawl, instead of being fastened to the ring of the anchor, is attached to the small line close to the stone. When thus set there is sufficient distance between the anchor on the buoy line and the stone on the small line to permit of the trawl being lifted without disturbing the anchor. In hauling, the buoy line is pulled up until the small line running to the anchor is reached, the stone is hauled up, and the end of the trawl is passed over the dory. One man unhooks the fish and the other baits the hooks. In this way the dory passes under the entire length of the trawl, the fish taken from it and the hooks baited in a single operation. The object of operating trawls in the manner described is for the purpose of keeping them in one position during the time fish are plentiful.

On sandy bottom the fish are sometimes eaten by sand fleas, and to prevent this glass balls attached to the ground line at frequent intervals keep the fish clear of the bottom, where the fleas are most numerous.

While the use of trawls by the *Vega's* crew was found to be quite successful, so far as catching fish was concerned, the difficulty of pairing off congenial fishermen and the finding of men who were familiar with the operation of trawl lines proved too much of a handicap, and in the latter part of the season hand-lining was resorted to.

A very important advantage in the use of trawl lines is that the men will fish with them in much deeper water than they will with hand-lines. The largest and best cod are found in the deeper waters, and it is from these that the owners would like the bulk of the catch to come, but the men when hand-lining either refuse openly to work in the deeper waters, or else secretly neglect the fishing and bring in but few fish when the captain insists upon anchoring on the deeper portions of the banks.

The experience of the *Union Jack* in trawling is described under the section devoted to shore stations.

For some years trawl lines were in general use by the station fishermen, but were eventually given up because large quantities of gear and fish were lost through the men being unable to get out to the banks in stormy weather and because the fishing required more skill than was possessed by most of the green hands available.

As the ground upon which they could fish was somewhat limited for trawl lines, the fishermen would first agree amongst themselves as to how the ground should be apportioned out. In setting the trawl line two men would go in a dory, but in fishing it the work would be done by one man, as the trawl would be allowed to remain on the ground for at least a week, and sometimes longer. Before setting the trawl the bottom would be carefully sounded with a hand line in order to be sure of getting the right spot for fishing. An anchor and line with buoy attached would first be dropped overboard, then the ground line would be paid out in such direction as had been agreed upon with the other fishermen, after which the other anchor and buoy line would be set. The ground line was left sufficiently slack that it could be hauled to the surface without disturbing the anchor, but not slack enough to permit of the line snarling. In fishing it the fisherman would go to the leeward buoy, haul up the bight of the line until it lay across the bow of his dory, then by hauling on this line would pull the dory against the tide in the direction of the other anchor, the line passing across the bow of the dory so that the hooks which came in one side were freed from fish and rebaited and thrown over on the other side of the dory until the trawl had been completely underrun or the dory filled with fish, when the line would be thrown off again and the trawl left set as before. The ground line of these trawls was 9-thread manila, while the buoy lines were of 6-thread manila, commonly known as "dory rode." The gangings were of 6-pound lines, i. e., 12 lines of 25 fathoms each weighed 6 pounds. They were 22 inches in length and were attached to the ground line at intervals of 3 feet. The number of hooks used varied from 500 to something more than 1,000, according to the number of tubs set.

During the season of 1913 the small power schooner *Union Jack*, which had its headquarters at the Pirate Cove station of the Union Fish Co., engaged in trawling on the inshore banks of the Shumagin Islands, mainly in West Nagai Strait.

As it was the intention later in the season to use the *Union Jack* in gill-net fishing for cod from the deck of the vessel by means of a net lifter (described elsewhere in this report), the machine was placed on board at the beginning of the season with the hope that it could be used in hauling trawl lines.

The process of tarring seemed to weaken the lines. Untarred lines were used for renewals and were found to be much stronger and more durable.

Both 32 and 20 pound cotton tarred lines were used for ground line, while the gangings were of 6-pound tarred lines. Experiment developed the fact that 20-pound lines were amply heavy and strong enough for the work and that untarred cotton lines were more durable and stronger than tarred lines, the tarring seeming to weaken the line. In the last experiments the gangings were each about 5 feet long and were attached about 6 feet apart, this being necessary owing to the high freeboard of the vessel.

Only a couple of skates of gear were rigged for experimental use with the machine. After being baited these skates were coiled on movable plank platforms about 5 feet long by 2½ feet wide. Placing one of these at the stern of the vessel, an experienced man could pay

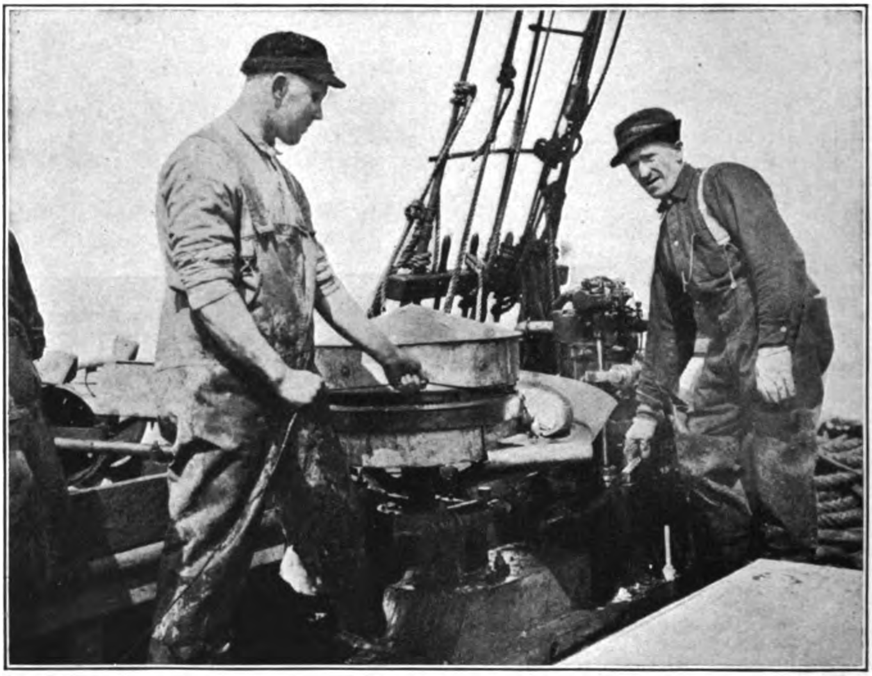

FIG. 1.—MACHINE USED FOR HAULING IN COD TRAWLS.

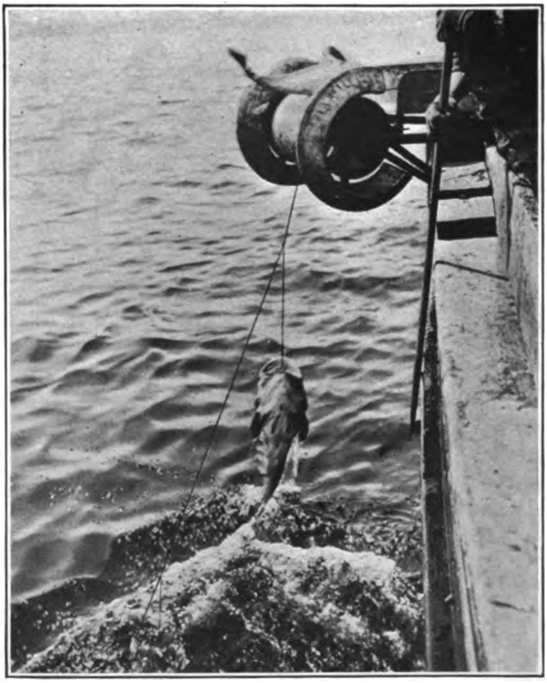

FIG. 2.—COD TRAWL LINE HAULED BY MEANS OF NET LIFTER ON DECK OF VESSELS.

out the line, as fast as the vessel could steam, by means of two short sticks (a method followed by the Norwegians) in order to prevent the possibility of the hooks catching in a man's flesh or clothing. An anchor and buoy was at each end of the trawl and it was set with the tide.

After being down a couple of hours the vessel came up to the leeward buoy in order to haul against the tide. The buoy was first hauled in by hand. The buoy line was then slipped under the fingers of the net lifter, the engine started up, and the line reeled in at full speed. When the anchor appeared the machine was stopped, the anchor lifted inboard by hand, and the end of the trawl placed under the fingers and the machine started again. Of the crew, one man ran the engine, one stood along the rail just aft of the machine with a long-handled gaff, ready to gaff cod which might break loose from the hooks, another stood just back of the machine itself and shook as many of the fish off the hooks as he could, while two other men removed and killed the balance of the fish and coiled down the trawl as it came from the machine, and attended to other work.

The vessel used for the experiment was not well suited to the purpose, owing to its slow response to the rudder—a serious handicap, as it is necessary for the vessel to be kept well over the line at all times and thus relieve it as much as possible from strain—and the high freeboard, owing to which a number of fish were lost because of their weight causing them to break loose while traversing this long distance; but despite this the experiment indicated clearly the value of the machine in hauling trawl lines from the deck of a suitable vessel.

As experienced fishermen were not available for carrying on power trawling from the deck of the vessel, the crew trawled by hand from dories during the rest of the season and met with good success. In operating from dories the trawls were rigged in the same manner as on board the *Vega*.

Gill netting.—In the summer of 1913 the author carried on some experiments in gill netting for cod in the waters adjacent to Pirate Cove, in the Shumagin Islands, Alaska. No originality is claimed for this method, as for a number of years gill netting for cod has been carried on in Ipswich Bay, Mass., and at a few other places along the New England coast, while about three years ago some of the Great Lakes fishermen visited Gloucester with their steam tugs and engaged in gill netting for cod, haddock, and pollock on a large scale. For a number of years the Great Lakes fishermen have carried on in those waters important gill-net fisheries for lake herring, trout, and whitefish. Steam tugs have been almost universally employed, and from 5 to 10 miles of netting set at one time. The use of this immense quantity of netting was made feasible by the employment of a patented power device, known as a net lifter, for hauling in the nets.

The net lifter is a circular machine fitted along the outer rim with a number of fingers. The mechanism operating these fingers moves on tracks, and is so arranged that the fingers take hold as they come opposite the rail of the vessel and let go when they have completed about two-thirds of one complete revolution from the point where they first gripped. By this means the net is grasped by the fingers as it comes aboard, and after being carried about two-thirds of the way around is released and allowed to drop on the deck. A framework extends from the lifter outboard, and at the outer end is a roller, while a sheet-iron trough for the passage of the net and fish runs from the roller to and partly around the machine and rests upon the framework. The machine is operated either by a small gasoline engine or directly from the main engine.

The net lifter is generally set on the port side, forward of the fore rigging, although it will work about as well when set on the starboard side, or when close aft of the fore rigging.

At my instance the Union Fish Co., of San Francisco, with its usual progressiveness, purchased the necessary number of gill nets for an experiment on a moderate scale, a net lifter, and a four-horsepower Imperial engine to operate same.

The gill nets were 125 yards long each and made of 12/3 cord linen. A specially made line was used for head, foot, and side lines. The nets were of 7½-inch stretch mesh and were 15 meshes deep. The floats, which were made of white cedar, were 2 inches by 5 inches, and had been soaked a number of times in boiling linseed oil in order to make them waterproof. Fifty of these were used to the net and were hung from the cork line and not strung on. The leads, which were 3½ inches long, with a diameter of thirteen-sixteenths inch, weighed 7 ounces each, were made to close on the line and not strung on, and were set opposite the floats.

As the nets were primarily for use during the winter season, when the spawning cod are on the inshore banks, the work carried on during the summer was merely preliminary and mainly for the purpose of accustoming the men to their use.

Boxes with flaring tops, so that they would nest, were constructed, and in these the nets were stowed, with the lead line at one end and the cork line at the other; these boxes would hold about four nets each.

When ready to set the boxes were arranged on the after deck, and as the vessel steamed along the anchor, buoy, and buoy line were thrown overboard, and the nets were then paid out by two men, one handling the cork line and the other the lead line. Another man bent on a new net when the previous one had almost run out. After all had been set they were held and marked by another anchor and buoy. The nets were set across the tide and as much as possible in the shape of a crescent.

While most of them were set on the bottom, a few were elevated slightly by means of glass floats. Almost invariably, however, the nets raised above the bottom caught no fish.

In hauling in the net a great deal depends upon the captain. In order not to put too much strain upon the nets or the machine, the vessel should be kept as nearly as possible over the former, and in certain kinds of weather and at certain stages of the tides this requires careful maneuvering on the part of the navigator.

The nets were set out in the evening and were taken up at as early an hour in the morning as possible, as the flesh of the cod will discolor if the fish are not bled soon after dying. Steaming up to the first buoy this was taken aboard. The buoy rope was then slipped under a couple of the raised fingers on the net lifter and the engine started. As soon as the fingers gripped the rope no further handling was necessary, except to coil it aft of the machine as it was reeled in at full speed. When the anchor appeared it was lifted aboard by hand and the head and foot lines of the net were then joined together, thus doubling the net over, and placed under the fingers and the engine started again. But few stops were necessary, and then only when a large skate would be found in the net, as the cod, halibut, and other fish passed along the trough around the machine without any trouble. A man with a gaff was stationed just aft of the machine, and his duty was to gaff all fish insufficiently meshed and apt to fall out of the net as it was lifted from the water. Other men received the net from the machine, shook out the fish, and stowed the former back in the net boxes.

An odd feature of the experiment was the comparatively large number of halibut caught in the few nets set one day. In one haul with 10 nets 180 cod and 60 halibut were taken, the halibut ranging in weight from 5 to 30 pounds. No halibut were taken in the other trials with gill nets, while none at all were taken in the course of the trials with trawl lines.

Ashore the nets were run onto large reels, and here they were dried and mended with a minimum of expense. The reels were so nicely adjusted that a child could turn one even when laden with four or five nets.

When in regular use it is the intention to have the nets divided into three sets. One of these will be in the water, one will be aboard the vessel, while the other will be ashore. All mending and drying of nets will be done ashore, the fishermen having nothing to do with this part of the work.

While the machine will work upon the codfish banks profitably, either with gill nets or line trawl, it is probable that the principal use of the machine in the near future will be in the salmon and halibut fisheries of Alaska. With one of these machines placed upon the deck of a cannery tender a crew of not more than five or six men could set out and haul in from 5 to 10 miles of gill netting in a working day, and do this in weather too rough for a Columbia River boat to live in. The gill nets at present in use could be changed at very little expense so as to work in the machine, and the work could be carried on much more cheaply than is the case under present conditions. With the use of a large power vessel gill netting could be carried on in the open bay or sea if the owner so desired.

In the halibut fisheries the use of the lifter would permit of all the trawl fishing being done from the deck of the vessel, thus doing away with the dories, and with it fishing could be carried on except during the more violent storms.

DRESSING THE FISH.

As soon as enough fish have accumulated on the deck the dress gang begins its work. The "throater" seizes the fish by the head in the left hand, places the back on the edge of a table or tub, and by means of a short knife with pointed end makes a cut each side of the throat just behind the gills (the front of the throat has previously been cut by the fisherman in order to bleed the fish) and another slit is made from the belly to the vent. The "header" then receives the fish, and, grasping the head and body, backward pressure is made across the edge of the table or tub, resulting in breaking off the head at the first vertebra. He then opens the belly with the left hand and tears out the viscera. It is then passed on to the "splitter," the most important member of the gang, who places the back of the fish against a cleat on a board and by means of a short, heavy knife, rounded at the end, and with the blade slightly curved flatwise, continues the split down the belly to near the end of the tail, care being taken to keep near the backbone. At about three-fifths of the distance from the neck to the tail the backbone is cut across, and is loosened so that he can catch the end in his fingers. Grasping this with his left hand he cuts under it toward the head of the fish and separates the upper part of the backbone from the fish. In this operation the knife blade is kept close to the backbone to prevent loss of flesh, and a good splitter will drive the knife no deeper than is absolutely necessary, as otherwise the thick flesh at the back would be almost cut in two, thus spoiling the fish for middles. The sounds are not saved, and it is but rarely that the livers are saved on the vessels.

The fish are then passed to the "black skinner," who, with an old glove or a piece of bagging, rubs off the nape skins or membrane covering the napes, also any blood spots, and then drops the fish into a tub of salt water. Here the fish are soused around until thoroughly clean by the lesser members of the gang, who are called "idlers," when they are removed and passed through a chute into the hold, where the "salters" receive them.

The salters lay the fish on their backs with napes and tails alternating, with the exception of the top layer, which is turned back up. A liberal sprinkling of salt is thrown over each layer, an especially heavy portion being put on where the fish come in contact with partitions or the sides of the vessel. The kenches are about 4 feet deep and extend from side to side of the vessel and the full height of the hold. The first kench is usually started in the forward part of the hold and the salter works toward the after part. As the kenches settle additional fish are placed on top to keep the compartment full.

A great deal depends upon the thoroughness with which the work of salting is done, as it is important that every part of the fish shall receive a share. If the salting is well done, it is not often that the fish need to be rekenched; but if the salt is used too sparingly or is unevenly applied, souring may start, which necessitates moving whole kenches and resalting. Sometimes the effort is made on the Atlantic coast to salt a little slack in order to make the fish heavy on reaching port, with the result that the whole catch may be lost. Slack salting, owing to the length of the trips and the fact that the fishermen would not benefit because of the increased weight of the fish, is rarely ever attempted on this coast. As the fish lose their water from salting it runs to the bottom of the hold and is pumped out. About 21 sacks of salt (weighing 100 pounds each) are used to 1,000 fish when in kench.

Soured fish have a peculiar odor, not very different from that of sauerkraut. Those accustomed to handling the fish become expert in recognizing this trouble and pick out the infected fish instantly.

Much is said by the fishermen about the practice of dressing the cod on the banks and throwing the gurry overboard, claiming that the gurry decays on the bottom and the taint drives the fish away. As sand fleas (amphipod crustaceans) are very abundant on the inshore and offshore banks, these scavengers, along with the sculpins and other bottom feeders, speedily remove every particle of edible meat from the gurry, thus removing every possibility of the water becoming polluted. At the various stations, should a couple of days' stormy weather prevent fishing, the sand fleas will be found to have almost caught up with the accumulation of gurry, while at the seasonal stations a month after the season closes the usual large pile of gurry has been reduced to a comparatively small heap of bones absolutely cleaned of all flesh.

SHORE-STATION METHODS.

The methods followed by the shore stations are somewhat different from those on board the vessels.

The shore fishermen usually arise between 3 and 4 a. m. in summer and between 4 and 5 a. m. in winter. After getting breakfast the men row out to the near-by banks in their dories. From 9 to 12 they come straggling in with varying numbers of cod, the latter depending somewhat upon luck, but mainly upon the knowledge on the part of the fisherman of the "good spots" and the persistency with which he fished. The dories in use will hold from 180 to 220 fish, the number depending upon their size. A dory with the greater number could be handled only in calm or fairly calm weather, as it would be so low in the water as to ship a sea at every lurch in rough weather.

Upon reaching the station the fish are pewed by the fishermen from the dory into a box located on the side of the wharf and midway between the top and low water. From here the fish are pewed onto the dress-house floor (the dress house is either at the end of the wharf or midway of the same), the agent or his representative keeping the tally as the fish are thrown upon the floor.

In the bunk house is hung a board ruled so as to show the name of each fisherman and his catch from day to day, and as soon as all the boats are in the agent fills out on this board the catch of each man for that day, thus giving the men an opportunity to know just how they stand and to have any corrections made should they be necessary.

Dinner is at 12 o'clock, and shortly after the fishermen gather at the dress house and, dividing themselves into as many dress gangs as their numbers will permit, begin the work of dressing. No special dress gangs are employed at the stations, this work being considered a part of the fisherman's regular work.

That portion of the dress gang in the dress house is generally composed of a "throater," a "header," a "splitter," a "black skinner," a man to go over the fish and remove adhering backbones, clots of blood, portions of black skin, etc., left by those who had previously handled it, and a man to pew the fish into the throater's box. The duties of these men are about the same as on the vessels. Each dress gang is equipped with a box set up on legs and with a sloping gridiron bottom, so that water, slime, etc., will pass out through the bottom. In this box the fish are placed with their heads toward the throater. Alongside and attached to this box is a table. The header stands at the end next to the box, on the opposite side from the throater

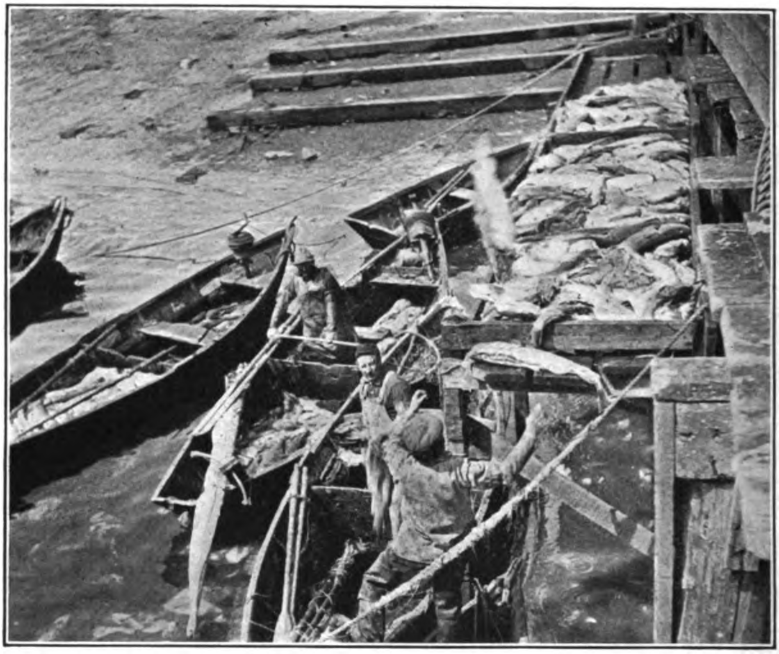

FIG. 1.—LANDING THE DAY'S CATCH AT THE SHORE STATION.

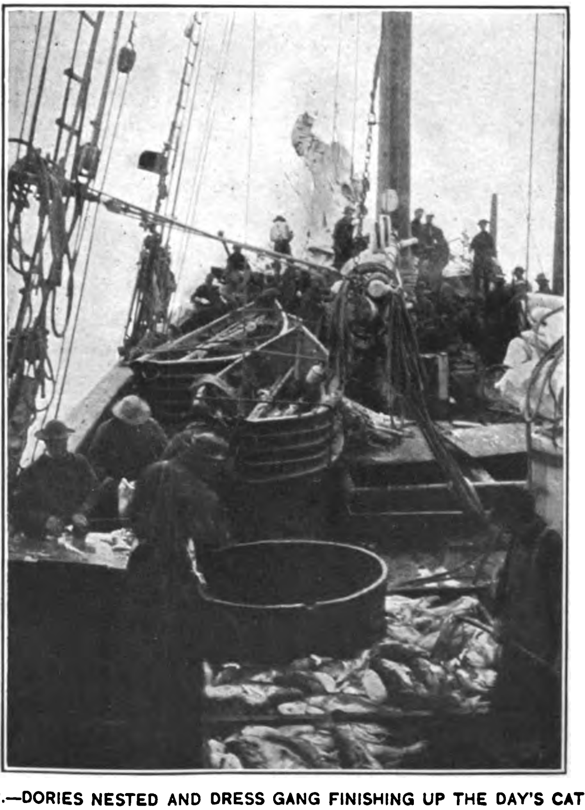

FIG. 2.—DORIES NESTED AND DRESS GANG FINISHING UP THE DAY'S CATCH.

and splitter, and has in front of him a piece of iron fastened to the edge of the table, over which he breaks the backbone of the fish as they are passed to him. At the other end of the opposite side of the table stands the splitter. In front of him has been inserted in the top of the table a piece of wood about 15 inches long and about 10 inches wide. In this has been driven a sharpened nail, to which the fish are attached, so they will not slip away while he is splitting them, the board inset being for the purpose of obviating the necessity of renewing the whole top of the table after the splitter has cut and chopped here for a short time.

There are usually two or three gangs at a station, and, in addition to the above, there are usually two men who trundle the dressed fish in large wheelbarrows to the butt house, where two salters receive and salt them in the large tanks.

During the summer months the livers of the cod are saved and dumped into large casks just outside the dress house, this work being done by the header. Here they are allowed to rot out. The oil gradually comes to the surface and at intervals is dipped out into barrels or drums. No attempt at present is made to prepare medicinal oil, although the Union Fish Co. has a plant for this purpose at the Pirate Cove station. As the healthy and diseased livers are used together, only oil suitable for use in the arts is rendered at present.

The offal passes through chutes into the water under the dress house, from whence it is either washed away, rots, or is devoured by gulls and sand fleas. At some stations the latter are so numerous that in a surprisingly short space of time the bones of the fish are polished clean.

The salting houses are long, low structures, with but few windows, which leaves them usually in deep twilight. They are generally arranged with two rows of square or round tanks, with a passageway between them for the wheelbarrows to pass in and out. The large square tanks hold about 4,000 medium-sized fish, while the large round ones hold about 3,000 medium-sized fish. These tanks are generally made of redwood staves or planks held together with metal hoops or bolted together with iron bolts. At a few places small hogsheads are employed. These receptacles frequently are in use for years.

Before the dressing begins each salter brings from the salt house about the number of bags of salt he expects to use. This is usually figured on the basis of 17 sacks (holding 100 pounds each) to 1,000 fish. The quantity used varies, however, with the weather and the fatness of the fish.

The fish are carefully placed in the butts in layers, face, or flesh, side up. Salt is sprinkled over each layer, care being used to see that every part of the fish is covered. The layers are carried from 18 inches to 2 feet above the top of the butts, so as to allow for the settling which will occur as the water is drawn from the fish. No pickle is necessary on these fish, as they make their own. When the fish have settled below the top of the butt, which they will do in a few days, several layers of new fish are added. In Alaska the pickle in the butts is kept usually at from 87° to 97° salinometer test, the average being about 90°. As the climate in Alaska is nearly always cold and damp, there is but little danger of fish spoiling if ordinary care is used. Fish will keep indefinitely in strong pickle so long as they are covered with it. If kept for a long time the pickle must be added to occasionally to repair the losses, particularly from leakage. At the stations the fish at the top of the butts are usually inspected every few days. When the pickle begins to weaken the top layer is turned backs up and a few bags of salt laid on top. These press the fish down, and, the salt being in the bags, it dissolves much more slowly than if thrown loosely over the fish.

At a few stations where the salinometer is not in use the agent depends upon the use of a potato to determine when the pickle is strong enough. If the potato floats at the surface of the pickle it is strong enough for curing cod.

The pickle forms very rapidly in the early stages of the curing, and the surplus is allowed to escape at intervals through a bunghole in the butt.

Care must be taken to see than the roof does not leak during the heavy rains, as should fresh water drip into the butts the fish will become slimy.

Should the run vessel be delayed and a station become filled to its butt capacity, a space is usually cleared in the salt house and the fish taken from the first filled butts and kenched on the floor, a little salt being sprinkled between the layers and over the top. Every effort is made to hold them in the butts as long as practicable, as they retain their natural white color much better when in pickle, kenched fish usually acquiring a yellowish color.

When the station vessel arrives the pickle is allowed to run off the fish, and they are pewed out into carts and wheeled along the dock to a point opposite the vessel's hatch, where they are dumped into a chute and pass thence into the hold, where men receive and kench them in the same manner as on the fishing vessels, almost no salt being used, however, as the fish are already well cured and also have a considerable quantity of salt adhering to them.

At stations where the vessels can not lie alongside the dock, owing to shoal water, the vessel is usually anchored in the bay or harbor, and the fish are brought out to it in dories, which are loaded from

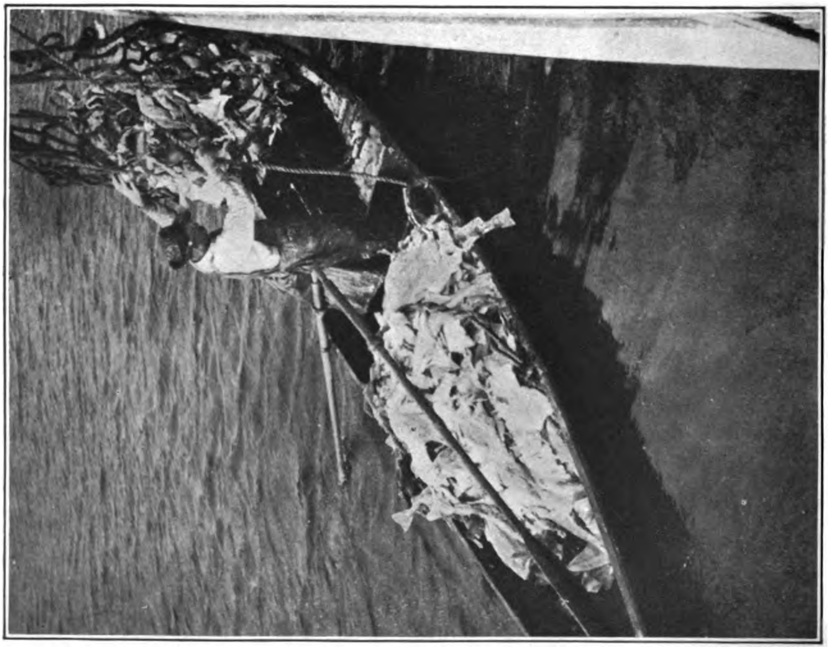

FIG. 1.—LOADING CODFISH ABOARD THE TRANSPORTER BY MEANS OF NETS.

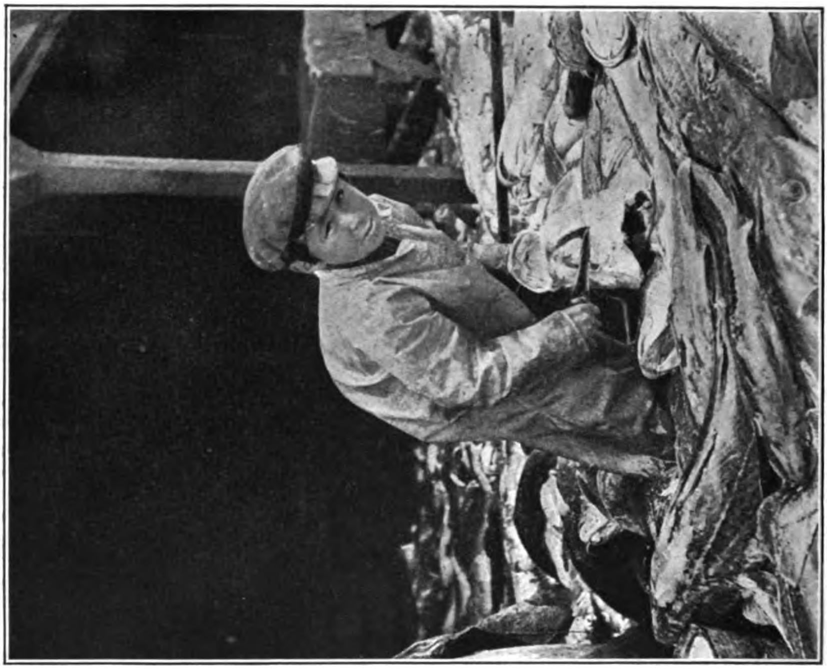

FIG. 2.—NATIVE BOY CUTTING OUT COD TONGUES.

a chute rigged up at the outer end of the dock. When a dory is full it is rowed out alongside the vessel and the fish pewed over the rail. As the vessel's rail is a considerable height from the surface of the water when she first begins loading, it is generally necessary to rig a stage about midway between the surface of the water and the top of the rail. The fish are then pewed onto this stage, whence one of the crew pews them over the rail onto the deck, where another man pews them into the hold. This method is very expensive, as it requires a large number of men, is quite slow, and also injures the fish through the excessive number of times that the pew is driven into them.

In 1912 one company had square rope nets made similar to those used by cargo vessels in handling small packages. A small one is placed in the forward end of the dory and a larger one in the after end, space for the boatman to stand being left between the nets. The fish drop from the chute into these nets. When the dory arrives alongside the vessel the cargo hook is lowered over the side. The four corners of the net have been drawn together at the top and these are slipped over the hook, the vessel's donkey engine started, the net with its contents lifted over the rail and lowered into the hold, where it is emptied by catching the hook in the meshes at the back of the net and starting the engine again. As the net comes up it is emptied, after which it is swung over the side and lowered into the dory, when the operation is repeated with the other net. By this method a vessel is loaded in about one-third the time previously required, while but few fish are lost alongside the vessel owing to carelessness in pewing. Another advantage is that it is not necessary to pew the fish after they are thrown into the carts.

There is a considerable loss of fish in passing them from the dock to the dory, especially in rough weather, when the dory is bobbing up and down like a cork. The use of chutes with closed sides and built-in sections, so that they could be lengthened or shortened as the tide ebbed or flowed, would save a considerable part of the present wastage from this cause.

If the net method is not employed the best way would be to have medium-sized scows for transporting the fish from the dock to the side of the vessel. With these the waste would be almost negligible, as they would be so much larger than the dories that practically no fish would be lost overboard while the scow was pitching and rolling in the swell alongside the dock, and owing to the greater weight and size of the scow the work of loading could be carried on in weather too rough for dories to work.

WASTAGE IN THE INDUSTRY.

There is much more waste in the Pacific fishery than in the Atlantic, and this is due mainly to the different methods of arranging the fishing lay. In the Atlantic fishery every man has an interest in the catch, and it is to his advantage to utilize every portion of the fish, thus increasing the total value of the fare, which will mean a larger share for himself in the final division. In the Pacific fishery the fishermen are paid a certain sum per thousand for fish running over a certain size and a less sum for fish under that size. On the vessels the fishermen have nothing to do with dressing the fish, this being done by a separate gang, who are paid regular monthly wages. At the shore stations the fishermen dress their own fish and are paid a certain sum per thousand for all caught. As a result of this arrangement the Pacific crews resent doing more than merely catching and dressing the fish, and they even skimp the latter part all they possibly can.

Livers and tongues.—As they receive no pecuniary benefit from the saving of livers and tongues, they naturally make no effort to do so unless compelled to by the owners. In dressing the fish at certain stations the header is expected to tear loose the liver and drop it into a bucket, which, when full, is dumped into the liver butt; but even at these stations probably not one-fifth of the livers available are saved. At some stations and on certain vessels an extra boy is engaged, whose business it is to cut out tongues, for which he is paid from $3.50 to $5 per barrel, and his board.

Sounds.—Several times efforts have been made to cut out and save the sounds, but the men have always asked such a high price per hour for the work, and so few would be secured in an hour's time, owing to the difficulty in cutting them loose and the general disinclination of the cutter to work, while their thinness made it necessary to cut out a large number in order to fill a barrel, that the cost of obtaining them was out of all proportion to the selling price.

Cod roe.—During the winter and spring the cod are spawning in Alaska, and as large quantities are captured by the station fishermen at that time, cod roe is exceedingly abundant. The roe of the cod is an excellent food product, but except for a few served to the men in the mess houses no use is made of them. They could be preserved, either by pickling or freezing, and a possible market found for them in this country.

In the Atlantic fisheries large quantities are prepared as "rogue" and shipped to France, where it is used as bait in the sardine fisheries. In preparing "rogue" the roes should be soaked for some days in old brine and then packed in strong casks holding about 25 gallons each.

Heads and cheeks.—To many, a cod head, well cooked, is the choicest part of the fish, but unless one is at a shore station or aboard one of the vessels when fishing, it is impossible to get one. If some one were to bring heads down to the coast States in brine he could doubtless build up quite a market for them. As nearly all of the nutriment is in the lower half of the head, a small band saw could be installed, and the upper half of the head, which is bony and contains but little nutriment, cut off and thrown away, and only the lower part, which contains the fleshy cheeks and the succulent tongue, saved. When glue and fertilizer plants are established at the stations, as will doubtless be done in the near future, the upper part of the head, which is rich in glue, could be used for this purpose.

Should it not be considered desirable to save the heads, the cheeks (a good-sized piece of choice flesh on each side of the head) could be cut out and preserved. Halibut cheeks, which are no more choice than cod cheeks, are always to be found in our larger coast fish markets.

Bones.—Fish bones are coming into quite general use by preparers of chicken food. These people grind up the fish bones, and, mixing them with other ingredients, have an excellent food for chickens. At present it does not pay to ship the bones, owing to their lightness as compared with their large bulk, but machines for grinding the bones could be introduced and the powder obtained shipped profitably.

Salt.—A large amount of salt is thrown away annually because of the belief amongst packers generally that salt once used in pickle, though not dissolved because of the excess employed, becomes exhausted. That this is not true can readily be demonstrated by dissolving it in water and testing it with a salinometer. While it might not be desirable to use it a second time in the salting tank it could be washed and used in curing snappers and other fish which are to be marketed in a pickled condition.

PREPARING COD FOR MARKET.

As soon as a fishing or station vessel reaches its home station the fish are landed and put into long troughs filled with water, where they are cleaned with brushes. They are then put into butts in the storage houses, backs down, except the top layer, salt being sprinkled between each layer, the amount used depending upon the degree and length of salting on the vessel. On top of the pile is placed about half a bushel of salt to strengthen the weak pickle which floats up to the surface. If the fish have been but lightly salted on the vessel, one or two bags of salt are laid on top of the fish and the salt allowed to melt gradually. The fish remain in the butts under shelter until orders are received, which may be a year or more; in that case more salt being added from time to time; but the sooner they are used after the first few weeks the better, otherwise they have a tendency to turn yellow. Sunlight will also turn them yellow, so every effort is made to keep the storage house in deep shadow. The butts are either immense hogsheads or square tanks made of bolted timbers, and are used over and over again for years.

The curing of salt fish depends upon drying, and this is accomplished in three ways—by the use of salt, by pressure, and by exposure to the air, either in the open air or in a drier. On this coast all three agents are employed.

When the fish are taken out of the butts they are piled in a kench or water-horsed to drain off part of the brine and to give the fish a smooth appearance. The fish are stacked face down, with the exception of the lowest layer in contact with the rack, in kenches about 4 feet high. If there is urgent demand for them, they are left in this condition for 24 to 48 hours. If more time can be allowed, they are repiled at the end of the first or second day, so that the fish on top may go to the bottom and be subjected to pressure to squeeze out part of the water. If the weather is unfavorable for drying the kench is repiled every second or third day, and this may be continued for 10 days or more. With full-pickle fish, such as prepared on this coast, it is not necessary to kench or water-horse so thoroughly as in the case of slack-salted or hard-dried fish.

From the water-horse the fish go to the flakes, which are of two kinds, stationary and canting, the former being the more common. The flake consists of a lattice bed about 8 feet wide, 30 inches high, and as long as the requirements may demand. The lattice used on this bed is made of triangular strips 1 inch on the base, placed about 3 inches apart. The fish therefore rest upon a sharp edge about every 4 inches, this giving the maximum circulation of air about the fish. The canting-flake frames, of which there are a number in use on this coast, are fixed only at the middle and to a horizontal axis, so that they can be turned at an angle with the horizon, in order to expose only the edge of the fish to the sun and to get the benefit of even a slight breeze. They are practical only in yards running north and south.

Rectangular boxes, with peaked roofs, known as "flake boxes," are used for covering the fish, when gathered together in small heaps, from dampness or rain. This box is generally 38 inches long. 22 inches wide, and 14 inches high, the whole being made of ¾-inch rough boards.

The fish are spread out carefully on the flakes with the face side up and the drying is continued as long as may be necessary for the particular grade of fish. The full-pickle fish are dried for the shortest period, as they can not be skinned readily if too dry, and, furthermore, the trade seems to desire fish which are moist and not too hard, and these retain practically 50 per cent of their water. If the sun is fairly warm and there is a good breeze, the drying can be accomplished in about 10 hours as the minimum time, but this may be greatly increased with unfavorable weather conditions. Only one drying is usual for the full-cured fish.

Fish intended for Porto Rico, or export, are usually kenched directly from the vessel and not placed in butts. When needed they are dried for three days, "sweated" for two days, then again dried for two days. The object of the sweating is to bring the moisture out of the interior of the fish. The drying on the flakes removes the moisture from the surface and crystallizes the salt, but to get the moisture out of the center of the meat the fish must be piled in the kench, where the dry salt takes up some of the remaining moisture, so that the second drying on the flakes has a greater effect. The export fish are usually dried sufficiently hard to withstand the pressure of the thumb in the thick part of the flesh without retaining the impression. The full-pickle fish lose about 9 per cent of their weight in drying on the flakes. When cured they retain about 50 per cent of their moisture, and the hard-dried from 25 to 30 per cent.

The sanitary conditions around a flake yard must be carefully looked after, as otherwise flies will breed and cause fly-blowing on the slack-salted fish.

Nearly all of the home stations on this coast have large artificial driers. These consist of inclosed rooms in which there are shelves of hot-water pipes, above which trays of fish are placed, and the air is made to circulate over them by means of a large fan. These dry kilns are used chiefly in the drying of export fish. During foggy and damp weather and in winter when sunlight is rare they are used frequently.

After the fish have been dried they are carted to the storeroom and kenched until packed for shipment.

If the fish are to be boned and skinned they are taken to a separate room. Here the operator first cuts off the dorsal and ventral fins, then starts the skin at the nape and pulls it in toward the middle of the back and then toward the tail. If the fish has been properly cured the skin can be stripped off clean without tearing the flesh. The tail is then cut off, after which the fish is turned over and the nape bones removed with a small iron gaff called a "bone hooker." The remaining portion of the backbone is cut out and the pectoral fins cut off. If it is to be put up as "absolutely boneless" the fish is passed to the bone pickers, who remove with forceps the ribs and any pieces of bone left in the body. If the fish are to be packed as so-called "boneless," then the fins only are cut off and the thick part of the backbone cut out closely, the small pieces of the fins, ribs, and backbone being allowed to remain.

In making "bricks" or blocks the fish are then cut to the desired size on a table made of blocks with openings between them at regular intervals. The fish, sometimes as many as eight or nine, are laid one on top of the other on the cutting table so that the best parts come between the openings. Then a long-bladed knife is driven through them and they are ready to be packed into bricks, etc. A trough, or miter box, is also used for securing the same result.

The pieces of fish are passed to girls, who sort them and weigh out exactly a pound or 2 pounds, whichever the weight of the brick is to be. Two good slices are selected to make the outside of the package and short or narrow strips to make up the middle part. The weighed fish is passed to the brickmaker, who selects, first, the piece which will make a whole side and an edge, and places it in the galvanized-iron mold; the smaller pieces are then put in, and lastly the remaining large piece to make a side. The selecting and placing of the pieces in such a way as to make the best appearing cake is quite a knack. The mold, which is 6 inches long by 3 inches wide and 3½ inches deep, is pressed tightly by foot or hand power, held for a few seconds, and then strings, which had previously been placed across the bottom of the mold in grooves left for the purpose, are tied around each end. The package is then completed by wrapping in paraffined or parchment paper with recipes and other matter printed on it. Some packers wrap in the parchment or paraffined paper and then inclose in a lithographed wrapper. There are several grades of bricks, depending upon the appearance and color of the fish, the choiceness of the pieces used, and the special curing to which the fish was originally subjected. Twenty-four 1-pound, twelve 2-pound, or twelve 3-pound bricks make a crate or case. The "boneless" fish put up in 5-pound boxes, but not pressed, run 12 to a crate.

Several forms of presses are used in this work, the most common consisting of a sliding box having two or three compartments, each of the size desired, and so arranged that a hand or foot lever forces a block down in one compartment at a time. The pressure remains while the fish are being placed in the second compartment, and when it is released the box is slid along until the second compartment comes under the press, when the brick in the first compartment is removed.

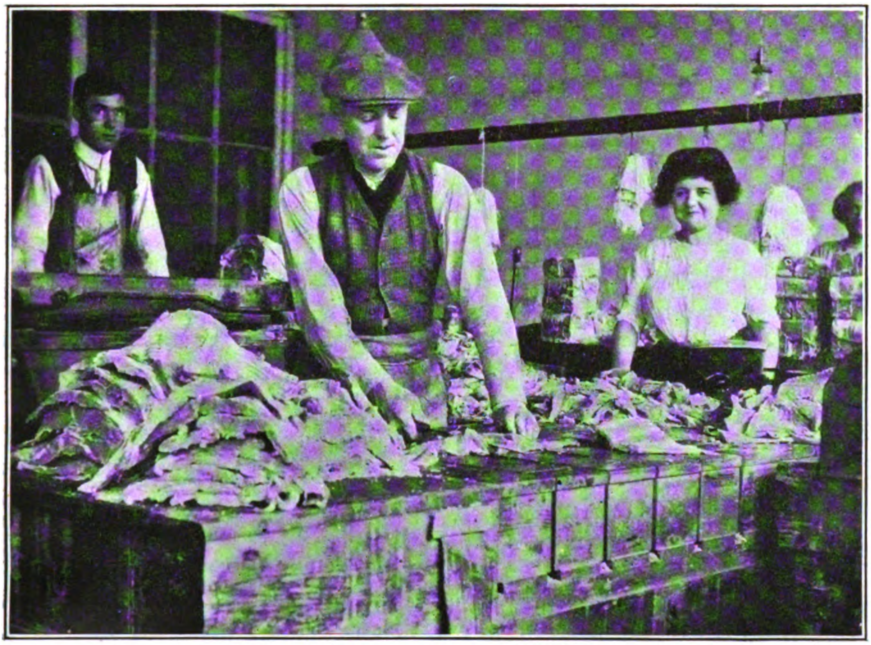

FIG. 1.—CUTTING STRIPS FOR THE MAKING OF COD BRICKS.

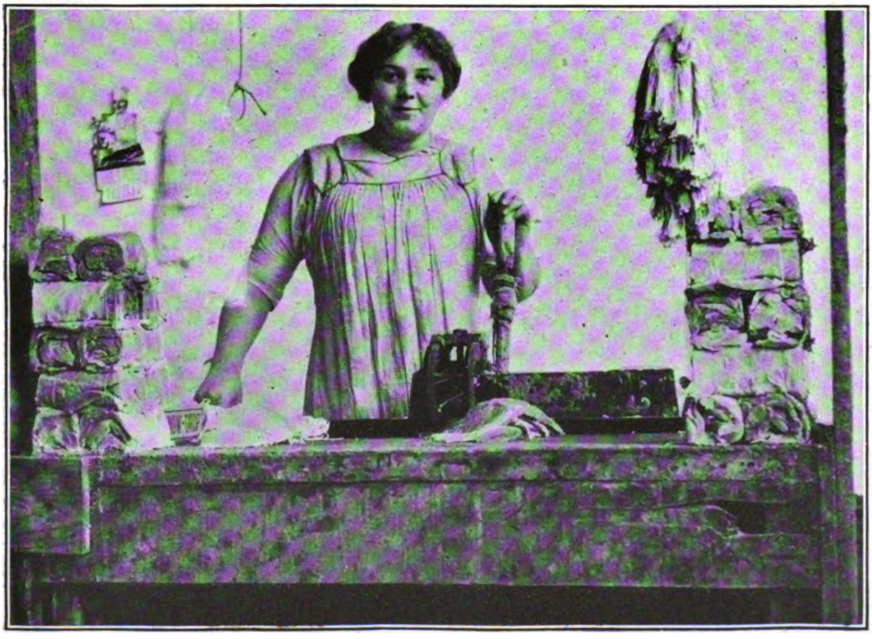

FIG. 2.—MAKING COD BRICKS.

Shredded codfish, known as "desiccated codfish," "fibered codfish," "flaked codfish," and "skriggled codfish," is made up from the trimmings not otherwise used in packing the regular tablets, and is prepared on this coast by only one company. The material used is as good as any employed, but the pieces are too small to be used in the regular brick. It is run through a machine which tears the muscle into small fibrous bundles. In order to get this very fine and fluffy it may be necessary to press out part of the water after the first treatment and run it through the machine again, and then sift it to free it from all particles of bone. The shredded fish is put up in 5 and 7 ounce cartons and jars, the latter being hermetically sealed in vacuum. Twenty-four boxes or jars make a crate.

A considerable quantity of skinned cod is put up in 100-pound cases. These are divided into "Large whole," "Extra large whole," and "Eastern style." These cases contain some of the finest of the whole cod cured, and the grade is fixed by the number of fish in the case. The last named are packed in eastern wood and are supposed to most nearly resemble the eastern fish of the same size and style of preparation.

The Porto Rican export, or hard-salted fish, are packed in drums, boxes, and bundles to suit the order, but there are regular drums for 50, 100, 200, 300, and 448 pounds. The 448-pound drum is used very largely in the Porto Rican trade. The fish packed in drums are all well dried.

When placed in drums the fish are carefully arranged in circular fashion, with the flesh side up, until several layers have been put in, and then a layer is placed backs up. The fish are then well tamped with a heavy wooden tamper. Fish are again added and the tamping repeated at intervals. When the last fish are finally piled on the drum they will extend several inches above it, and a ratchet or a hydraulic press is necessary to force them down so that the head can be put in.

During the winter months a small business is done in preparing bacalao for the San Francisco trade. Usually this business is controlled by eastern packers who use the very small haddock in preparing it. Occasionally small haddock are not available from eastern waters during the winter season, and it is then that the Latin-speaking peoples of California fall back upon the local packers for their supplies. Small snappers, of which there is never a large supply on this coast, are used, and the fish are hard dried and then packed 100 pounds in a drum. It is fortunate that the business is not more extensive on this coast, as it means a heavy drain on the young cod, which if allowed to live a year longer would be much enhanced in value.

Large quantities of cod are sold after having been water-horsed and packed in bundles weighing 50 and 100 pounds. These fish are not skinned. A considerable trade in this grade of fish is had with the Hawaiian Islands.

Skinned fish are also put up in strips and middles. The strips consist of one-half the fish split down the middle and are cut to suit the trade—some left whole and some with more or less of the nape and thinner portion at the tail cut off in order to get heavy pieces. These are put up usually in 20 and 40 pound boxes. The middle is the whole fish after being skinned and the nape and tail cut off; how much of the nape and tail is cut off depends upon the number of middles permitted in a box of a certain size. They are quoted usually by the size—8 to 10, or 10 to 12, in a 40-pound box. They are also packed in 60-pound boxes. Frequently each individual fish is cut transversely the width of the box and folded over itself. Thick fish are sometimes cut transversely and each piece split and folded over in such a manner that the clean cut appears outside. The fish are also sometimes cut transversely across the fiber and tightly packed in boxes with the fiber running perpendicularly.

The trade in brine-salted codfish on the Pacific coast is small, and is confined exclusively to the small fish or snappers. In pickling, the fish are dressed, split, washed, and salted in butts in the same manner as has been heretofore noted in preparing dry-salted cod. When shipment is to be made the fish are removed from the butts, cleaned with brushes, and placed in tight half barrels, flesh side up, except the top layer, which is placed back up, the fish being bent to follow the curve of the half barrel. It is important that the fish be not repacked until thoroughly struck, otherwise the flesh will be marked with yellow spots caused by contact of the imperfectly cured fish with each other. Salt is placed at the bottom of the barrel and over each layer of fish, from one-half to three-quarters of a peck being used to each half barrel of fish. The barrel is then headed and strong brine added through the bunghole. About 38 medium-sized snappers are required to fill a half barrel. Most of these fish are sold to coasters plying up and down the coast and are fed to the crews.

The station fishermen frequently prepare a cod delicacy which they enjoy very much. Selecting a suitable cod stomach, the fisherman will carefully clean this inside and out. Several fresh, healthy cod livers are then picked out, chopped fine, and mixed with a little flour and vegetables; the stomachs are stuffed with this mixture, after which they are cooked like sausages.

Stockfish.—Of recent years a considerable business has developed in the preparation of stockfish. Two small shore stations in the Shumagins devote a considerable portion of their energies during the colder portion of the year to this work, while a few individuals occasionally have put up varying quantities.

In preparing stockfish the fish are split in the regular way to a spot a little below the vent. The backbone is then removed and the fish split into two equal halves as far as the first cut extended. Snappers are sometimes merely gutted.

The drying yard comprises a network of wires running from crosspieces nailed onto uprights. The fish are hung over these wires, flesh side in, and supported by the undivided portion of the tail. Here they are allowed to cure in the sun and wind, no salt at all being used, sometimes for as long as six or seven weeks, the length of time depending upon how much moisture there is in the atmosphere. During long-continued rains the fish are stored under cover, but it does not hurt them to remain out during ordinary rains. When bone-dry the fish are stowed away in dry, cool houses, and when shipped are bound by wires into bales.

This work is carried on in winter, which is the only season when comparatively dry, cold weather is experienced in the Shumagins. In shipping and storing these fish great care must be exercised to see that they are not placed in a damp room, or that anything damp comes in contact with them, as in that event they will become slimy.

Fish prepared in this manner will keep for a much longer period than when prepared by any other method. It is much practiced by the Norwegians.

When desired for the table a sufficient number are put to soak in water and remain there four to five days, the water being changed every day. When of the desired softness the fish are put in fresh water with some lye and allowed to remain about 24 hours. The lye cuts the slime from the fish and gives it an added flavor.

Tongues.—Cod tongues are saved whenever possible. On the vessels one of the dress gang usually cuts them out, while at the stations some one other than a regular fisherman usually does this work. A cod's tongue is attached to the lower jaw, and when cut out includes all that part of the jaw lying inside the jawbone. When cutting tongues the operator takes hold of the fish by the back of the head, using the eyes for finger holds. As he lifts the fish by the head its mouth usually falls open, then with his other hand he cuts the tongue loose on the sides with a sharp knife, then cuts loose the lower end along the curving bone forming the back part of the lower jaw. The tongue is then hanging by a thin strip at the forward end of the jaw, from whence it is torn loose by the hand. The tongues are cured loosely in barrels with salt, and after being thoroughly struck are packed in barrels holding 200 pounds, which are headed up, after which a strong brine is added through the bung. They are sold in these barrels or else repacked in half barrels, pails, and kits. Some are mixed with sounds and sold as tongues and sounds. As no sounds are saved on this coast, eastern sounds are employed in packing the latter.

Codfish tongues, especially when fresh, are considered a great delicacy. They are thoroughly washed in order to clean them, then dried with a clean cloth, rolled in bread or cracker crumbs, and fried the same as oysters. The salt tongues can be prepared in the same manner after having been thoroughly soaked in fresh water.

The packers never overstock with codfish tongues if it can be avoided, as in a year or two part of the tongue hardens, thus making it practically worthless as food.

Canning.—On the Atlantic coast a considerable quantity of cod is canned annually under the name of "codfish flakes." An even greater quantity of hake, haddock, and cod are canned together under the name of "fish flakes." The opportunity for canning cod is especially good on the Pacific coast. Several of the salmon canneries are located in close proximity to the cod banks, and as these plants already have the machinery and employees needed for carrying on this work in addition to the canning of salmon, cod could be canned much more cheaply than if a plant had to be erected especially for the work. As no other members of the Gadidæ other than the true cod are available on the Pacific coast for this work, the product could be sold under a cod label, which would considerably enhance its value.

Cod-liver oil.—At an early date in the fishery oil was being extracted from the livers of cod. In 1866, 10,000 gallons were reported as being rendered, which statement seems somewhat of an exaggeration when the then extent of the fishery is taken into account. In 1879 Lynde & Hough are reported as bringing to San Francisco 3,000 gallons of oil. In later years a small quantity was prepared each season, the quantity depending upon the demand and price.

All the oil prepared was by means of rotting the livers in large vats or hogsheads, and the resulting product, after being strained, was shipped in this condition.

In 1899 the Alaska Codfish Co. installed a refining plant at its Kelleys Rock station, in Alaska, and operated it successfully until 100 barrels (iron-lined receptacles holding 20 gallons) had accumulated, when they were brought to San Francisco and the oil offered for sale to makers of emulsion of cod-liver oil. At that time the market was overloaded with this grade of oil and the best price offered was about what the container cost, so the oil was stored and the plant shut down. A few years later the market picked up and the oil was disposed of at $22 per barrel. In the meantime the company's oil maker had disappeared and the plant was so badly dilapidated through the action of the elements that the industry was not resumed.

Later the Union Fish Co. installed a plant at Pirate Cove, but after refining a small quantity at no profit to the company, this plant was also shut down and has remained so ever since.

At present the small quantity rendered is shipped just as taken from the rotting tank, except that it is first strained.

Glue and fertilizer.—As early as 1893 a plant was started in California for the purpose of manufacturing glue from codfish skins and other refuse of the packing plants in the States. The material remaining after the glue had been extracted was prepared and sold as fertilizer. There are now two plants at Anacortes, Wash., and one in California which prepare glue in whole or in part from cod.

It is to be hoped that in the near future small plants for the manufacture of glue and fertilizer will be established at certain centrally located stations in Alaska, where the large quantity of heads, entrails, and spoiled fish can be utilized and not, as now, thrown into the water under the dress houses, where they pollute the water, while the bones remaining after the flesh has rotted away are gradually filling up the smaller harbors.

USE OF PRESERVATIVES.

In 1881 boracic acid was introduced as a preservative in the fish industry and was used continuously until 1907, when it was quite generally superseded by sodium benzoate. Boracic acid is but rarely employed on this coast at the present time, and when so employed it is on export fish. If this acid is used it is applied to the fish when they are being shifted in the water-horse or to the outside of the completed brick.

Sodium benzoate is almost solely the only preservative used on this coast. It is mixed with finely ground salt and applied by means of a powdering can like a large pepper box. It is used upon the fish in the storeroom if the weather conditions demand it, but its principal use is upon the fish as they are being weighed out into tablets and bricks. This preservative is used chiefly during the warmer months. The amount used is not weighed, but is dusted on to cover the whole surface, the effort being to apply from 0.3 to 0.4 per cent. When this preservative is used the package of fish bears the following label or stamp: "Sprinkled with one-half of 1 per cent soda benzoate. To remove, soak out in fresh water."

Preservatives are never used upon fish shipped to near-by points or if the fish are to be consumed very shortly after being shipped. Its use is generally upon fish shipped abroad, or fish shipped considerable distances in this country during the summer months.

MARKET FOR PACIFIC COD.

The development of the demand for Pacific cod has been one of slow growth against great obstacles. In the early days of the industry all of the catch was marketed on the coast, and as salt fish was scarce and in good demand, fairly good prices were obtained for an article which, in many instances, was only indifferently cured. The success of the pioneers led to a rapid expansion of the industry, with the result that the local market was soon overstocked and the curers had to look to the Middle Western and Eastern States and abroad for a market for the surplus.

At this period the eastern curers, and the large wholesale salt fish houses scattered throughout the country who purchased their supplies from them, controlled the markets for cod throughout the United States, while all of the cod exported from this country went from New England. Naturally these curers, and the wholesalers dependent upon them, did not welcome the intrusion of Pacific cod, and while they were unable to prevent the loss of the greater part of their trade on the Pacific coast, they fought hard for the rest. Dealers and consumers were told in some instances that the fish prepared by this coast's curers were not cod, or that they were a very inferior grade of cod; that the fish would not keep, etc. That these misstatements had a wide dissemination and made a considerable impression is evidenced even to this day in the prejudice which is met with in different sections of the country against Pacific cod.

Unfortunately, the Pacific coast producers, through ignorance, played right into the hands of their trade enemies when first invading the territory hitherto held by them alone. Some of the fish were poorly prepared and part of them were shipped across the continent during a season when the weather was warm, and as they had been stowed in ordinary box cars, the temperature of these corresponded to the weather, so that the fish arrived in the eastern market in very poor condition, thus disgusting the few dealers who had been willing to give them a trial. The shippers quickly discovered their error, and afterwards restricted shipments for long distances to the colder months of the year and also used refrigerator cars. The damage had been done, however, and from then on it was slow and discouraging uphill work extending the market for Pacific cod east of the Rocky Mountains.

The fight of the Pacific cod for admission into eastern markets is a typical example of how difficult it is to overcome a prejudice, no matter how insufficiently founded.

On the Pacific coast but one species of the Gadidæ, the true cod, or *Gadus macrocephalus*, is to be found of a sufficient size for dry-salting, and, as a result, is the only species sold in any condition other than fresh. At the very time the dealers were refusing Pacific cod, and for a number of years after, the vast majority of them were purchasing from eastern curers hake, cusk, and pollock, closely related species to the true cod, but much cheaper, and, in the opinion of those best informed, much inferior to the true cod, and selling these as true cod along with the cod itself. The advent of the pure-food law compelled the dealers to sell the fish for what they really were, and as a result the market for the Pacific cod has been rapidly widening since.

Being shut off from Europe and the east coast of South and Central America by high freight rates and the great distance the fish had to travel, the Pacific dealers directed their efforts toward Mexico, the west coast of Central America, the islands of the Pacific, and Asia with most gratifying results. At one time a large business was done with Australia, until that Commonwealth enacted a stringent law prohibiting the use of preservatives on shipments into that country of salt fish. As the goods had to pass through the Tropics on their way to Australia, and the Australians are not accustomed to using hard-cured fish, heavy losses through fish spoiling resulted from this prohibition and the market there has been much curtailed as a result.

Despite the natural and artificial handicaps under which the industry suffered a considerable trade has been developed in the West Indies, and this has been much enlarged since the European war broke out, the Norwegians, who formerly shipped large quantities to this section, have found a new market in Germany. The opening of the Panama Canal has also greatly aided in the expansion of the trade in this section of the world.

The Asian market will undoubtedly in time attain to large dimensions. At present, and for a number of years back, it has been steadily widening as the fish became better known and the means of transportation increased.

Hawaii consumes large quantities of cod and the greater part of this comes from the Pacific coast. San Francisco dealers ship nearly all of the bundle fish (fish which have been water-horsed and put into bundles of 100 pounds each and bagged) and a considerable part of the cased cod, while the Puget Sound dealers ship mainly cased fish.

Mexico is rapidly developing into an excellent market for Pacific cod, mainly for cased fish which have been harder dried than for consumption nearer home.

The increase in steamship lines to South and Central America, due to the opening of the Panama Canal, will greatly aid in the widening of the markets for Pacific cod in that region of the world.

The demand on the part of the public for dried cod is not what it ought to be, and a good part of this lack of demand is due to the archaic methods of doing business prevalent not only in the Pacific cod industry but also in that of the Atlantic.

If the shippers of codfish were to copy somewhat the methods followed by the meat packers they would have less loss from spoilage, while the fish would present a much nicer appearance and the demand for it would naturally increase. The only difference between salted meat and salted fish is that the latter is less liable to spoil.

When shipping to the Atlantic seaboard the dealers usually select the season from November to March and load the fish in refrigerator cars. The latter are cooled but little during the shipment. In shipping lesser distances the fish are usually stowed in ordinary box cars. Sometimes these box cars are shunted onto sidetracks and held for days at a time, and should the temperature rise above 65° F. during this period and under these conditions reddening is apt to appear.

The better plan is to have cold-storage depots located in trade centers. The fish could be shipped in refrigerator cars to these depots frequently, where they could be put in storage. The retailers could then be encouraged to order the fish in small lots, say enough to last for a week or 10 days, and thus they would always have on hand comparatively fresh fish.

In their eagerness, however, to do business the jobbers frequently overload the retailer, with the result that the fish dries out to such an extent that the salt crystallizes upon it and the fish presents an unattractive appearance, while if the temperature rises above a certain point reddening is apt to occur should conditions be ripe for it.

Grocery stores are the chief handlers of cod, and but few of them are properly equipped for doing this. It is but rarely that a customer who enters one of these stores will see dried cod on exhibition, or, if he does, it is usually whole fish jumbled up in a case and presenting an unattractive appearance. Usually the fish is kept in a back room or the cellar and is brought out only when the customer orders it. As many customers are in an uncertain frame of mind as to what they want when they enter a store, and usually decide after a glance over the visible stock, it follows naturally that but few ever order salt cod, and, owing to the extra labor involved in bringing the cod from the back room or cellar, the clerks rarely ever call the customer's attention to its existence.

If the retailer fitted up a small refrigerated show case with glass sides and top, somewhere in the store proper, he could not only keep in this his dried cod, especially the bricks, tablets, middles, etc., which could be tastefully arranged on china trays, but could also display a number of other articles which require to be kept in a cool place and which are usually sold in grocery stores, such as smoked fish, pickled fish, etc.

With the fish displayed thus prominently before the customer, his attention is at once attracted to it, and he is much more liable to purchase it than if the product were kept out of sight and only produced when a customer called for it.

The greater part of the bricks and tablets are now wrapped in white parchment paper with the brand and a little lettering printed on it in a neutral tint. A few of the more progressive dealers wrap them in the parchment and then inclose the package in an ornately lithographed wrapper. The latter makes a very attractive appearance, and undoubtedly aids in calling the attention of the consumer to the product, particularly if it is displayed as recommended above, as is the case in a few of the high-class delicatessen stores. An even better method would be to pack the bricks and tablets in lithographed cartons made to hold certain sizes. On one side recipes for cooking and preparing the fish should be printed; if the fish is improperly prepared by a cook unfamiliar with it, those who partake of it are not apt to want it again.

COMPARATIVE ANALYSES OF PACIFIC AND ATLANTIC COD.

Much has been said and written as to the alleged superiority of Atlantic over Pacific cod. While there are a number of analyses of Atlantic cod extant, the same, unfortunately, is not true of the Pacific cod. The only one available is that made for the Robinson Fisheries Co., of Anacortes, Wash., and the subject was a sample of shredded Pacific cod. Fortunately, there is one analysis of Atlantic shredded cod with which it can be compared. The analyses follow:

COMPARISON OF PACIFIC AND ATLANTIC SHREDDED CODFISH.

	Pacific cod.[a]	Atlantic cod.[b]
	Per cent.	*Per cent.*
Water	43.90	46.52
Protein (calc. from nitrogen)	37.19	30.85
Protein (calc. from differences)	35.00	....
Fat	.73	.33
Ash	20.37	22.81
Phosphoric anhydride	.69	....
Sulphuric anhydride	.07	....
Chlorine	11.37	....
Fuel value per pound ..... calories (calc.)	682	578

[a] Analysis made by Stillwell & Gladding, New York, N. Y.

[b] Foods and Their Adulteration, by Dr. Harvey W. Wiley, p. 126. Philadelphia, 1907.

REDDENING OF COD.

A source of considerable expense and annoyance to the codfish packers is the occasional reddening of the fish. While not so common on the Pacific coast as on the Atlantic and European coasts, due to the much lower mean temperature during the warm months and possibly the grade of salt used, yet it does appear at times.

Codfish and some other salt-cured fish are subject to spoilage when exposed to a temperature above 65° F. The spoilage is manifested by the surface of the fish turning red and emitting a foul odor. This is an old complaint on both coasts and in Europe, and has been increasingly expensive on the Atlantic coast, as the expansion of the industry has necessitated the marketing of greater and greater quantities of fish during the warm months of the year. It appears only on the dry-salted fish, as fish completely submerged in pickle seems to be immune so long as it is retained there.

The first sign of redness appears when the dried fish are stored on the ground floor and before the skinning and packing are done, but frequently it may not appear until many days after the fish has been packed and shipped.

Reddening is essentially a surface infection. Except as it follows fissures in the muscles, cuts, or breaks where the air has free access, it does not appear below the surface. On the whole fish, the favorite point of attack is near the backbone, and this is due to the greater thickness of flesh, which insures more moisture at all times. It is more often found upon the outside of the bricks or tablets.

Sometimes the affected fish is of a pale, pink color, at other times a bright red. Experiments have disclosed that the pink is caused by the germs being in a thin layer on very moist fish; the more intense color appears when the fish is drier and the germs form thicker spots or a series of colonies. In the latter stage the germs have a moister and more oily appearance, although both conditions may appear on the same fish. The redness may occur on either the skin or the flesh, or both, but is not so readily seen nor developed on the skin. So far as known, the infection occurs on the salted fish only, but as the germs have been found in water used to wash the fresh fish, it is possible they would develop on fresh fish should they be kept sufficiently long for the color to appear. As cod are not marketed in a fresh condition on the Pacific coast, this possibility does not concern our fishermen.

Cold checks the growth of the organisms causing the reddening, and in addition it also has the effect of bleaching the color which may be present.

This reddening of cod has been studied by a number of scientists.[a] As yet the source of infection causing the red discoloration has not been fully determined, but it is probable that the normal habitat of the organisms is in the salt water and lowlands along the coast, and, being saprophytic, they will grow upon the salt fish when brought in contact with them. This seems to be borne out by the fact that the organisms can grow freely upon fish or wood that is salty to any degree, and even upon the surface of salt crystals. Salt acts as a preservative by preventing the growth of most organisms, which would cause spoilage in foods, but it has no such effect in this case.

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[a] On the nature of the peculiar reddening of salted codfish during the summer season, by W. G. Farlow. United States Fish Commission Report for 1878, p. 969–974. (1880.)

Vegetable parasites of codfish, by W. G. Farlow. Bulletin United States Fish Commission, 1886, p. 1–4, 2 fig. (1887.)

Observations on the red flesh of the codfish, by A. Layet. Bulletin United States Fish Commission, 1887, vol. 7, p. 90–95. (1889.)

Preparation of the cod and other salt fish for the market, including a bacteriological study of the causes of reddening, by A. W. Bitting. United States Department of Agriculture, Bureau of Chemistry. Bulletin no. 133, 63 p., ill. (1911.)

Edington: Report of the Fisheries Board of Scotland, 1887.

Jordan: Massachusetts State Board of Health Report, 1890, vol. 2.

The finding of the organisms on the salt in the hold of a steamer and on the salt in the storehouses is evidence that it must have been infected where it was produced. The salt used is solar-sea salt, the salt beds are on low grounds and marshes near-by, making it easily possible for infection to occur during its preparation.

As investigation has proven that winter-cured fish—which have been packed at a season when the growth of the organisms has been arrested by the low temperature—spoil when exposed to a warm temperature, it shows that some source of infection must be acting continuously. If the infection were due wholly to the salt, then the use of mined salt or sterile salt would suffice to prevent spoilage. Experiments made with the refined salts showed some improvement over the use of the solar salt. While the lower temperature of this coast in summer has aided very much in reducing the amount of reddened cod, part of the improvement is ascribed by some packers to the use of a higher grade of salt than used on the Atlantic coast. In the Provinces some mined salt is used, but spoilage occurs there also. As the spoilage is the same no matter in what form or where the fish may be shipped, the infection must take place during the preparation of the fish, and can not, therefore, come from external infection of the finished product.

Should local conditions be such that the infecting organisms abound naturally, they may be carried into the boats, the butt sheds, the flake yard, the storerooms, and preparation rooms by the wind, on the boots, clothing, or hands of sailors and factory employees, and by the use of water in making pickle and cleansing the buildings.

A Gloucester (Mass.) packer claims to have used acetic acid successfully in preventing fish from reddening and also in removing the objectionable color from specimens carrying it. His method is to apply with an ordinary nasal atomizer a small quantity of a 10 per cent solution of glacial acetic acid to the exterior of the fish. Experiments carried out by Bitting[a] indicated that the amount necessary for inhibition is about one-tenth of 1 per cent. Distilled vinegar has also a decided inhibiting action on the growth of the organisms, but as an objectionable odor results it is not possible to employ this medium.

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[a] United States Bureau of Chemistry Bulletin no. 133, p. 34.

According to Bitting,[a] "the further the bacteriological work on the cause of the reddening of salt fish is carried the stronger the evidence becomes that it is due to factory infection, to the use of contaminated water, and to the methods of handling. The outside influences, particularly the germs found in the lowlands and in the vicinity of the factory, have probably been greatly overestimated. The amount of infection due to the use of solar salt has not been definitely determined, as in the experiments intended for that purpose the amount due to factory infection was not wholly eliminated. What at the beginning appeared to be primarily a problem of how to avoid spoilage in an infected product by preventing the growth of the organisms present now appears to consist rather in the usual difficulty of preventing infection."

As a result of his investigations, Mr. Bitting makes the following recommendations for the prevention of factory infection:

1. The fish should be handled from the vessel to the scales without being thrown upon the deck or dock where they may become infected from the boards or be stepped upon by the workmen. All of the docks are infected with the red organisms, and fish coming in contact with them become inoculated.

2. The floors, scales, dressing tables, wash tanks, wheelbarrows, and everything with which the fish come in contact in making them ready for the butts should be frequently washed with water under considerable pressure. A relatively small stream of water under strong pressure is far more effectual in cleaning than a larger stream of water at low pressure.

3. The fish should be washed by sprays of water or by a machine. The sprays should have sufficient force to do the work well. The present method of pitching the fish into a tank or dory and then out again is not sufficient for cleaning, and, furthermore, it tends to disseminate any organisms which may be present.

4. The water used upon the fish or upon anything with which the fish come in contact should be of undoubted purity. The use of harbor water for any purpose can not be justified, as it is filled with the germs which come from emptying the butts and washing fish and docks. It is also apt to be polluted with sewage from the city, as was found to be the case in the investigation here reported.

5. The butts should be thoroughly cleaned inside and out and steamed for 20 minutes or sprayed with a solution of sulphurous acid.

6. Before fish are taken out of the butts water should be turned in to cause the brine to overflow and wash away any reddening which may have occurred on the top.

7. The fish should be passed through a spray of water to remove the adherent salt, as this adds weight and does not increase the time of keeping.

8. Racks used in water-horsing should be steamed or sprayed, and the work be done in the light and in one place in the factory rather than at any point in the shed where the butt may happen to be.

9. The drying should be carried as far as possible and still permit proper skinning. A second drying, or Nova Scotia style of cure, should be encouraged.

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[a] United States Bureau of Chemistry Bulletin no. 133, p. 61.

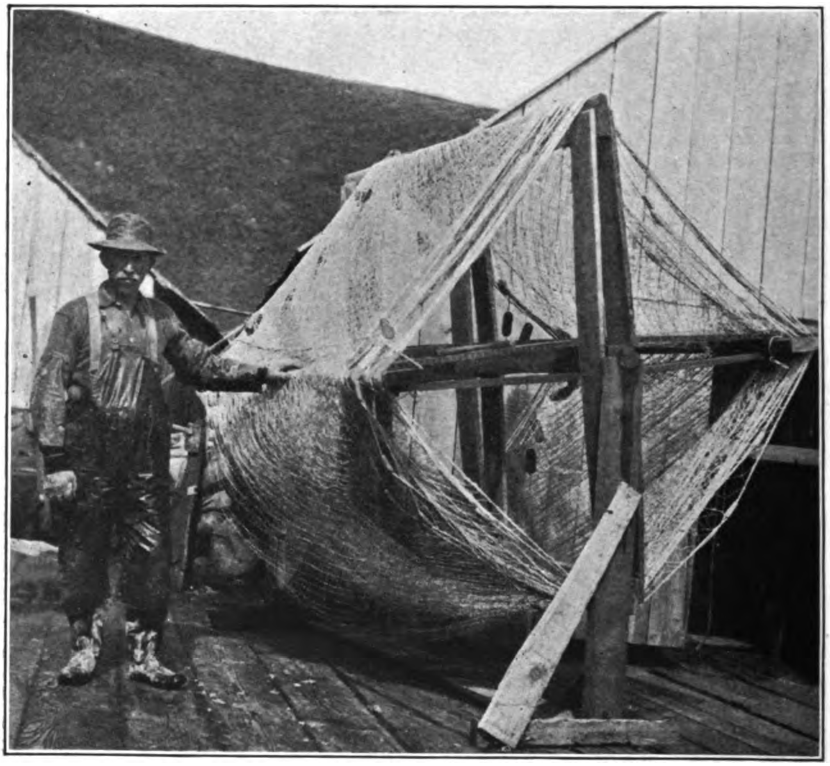

FIG. 1.—COD GILL NETS ON DRYING REEL.

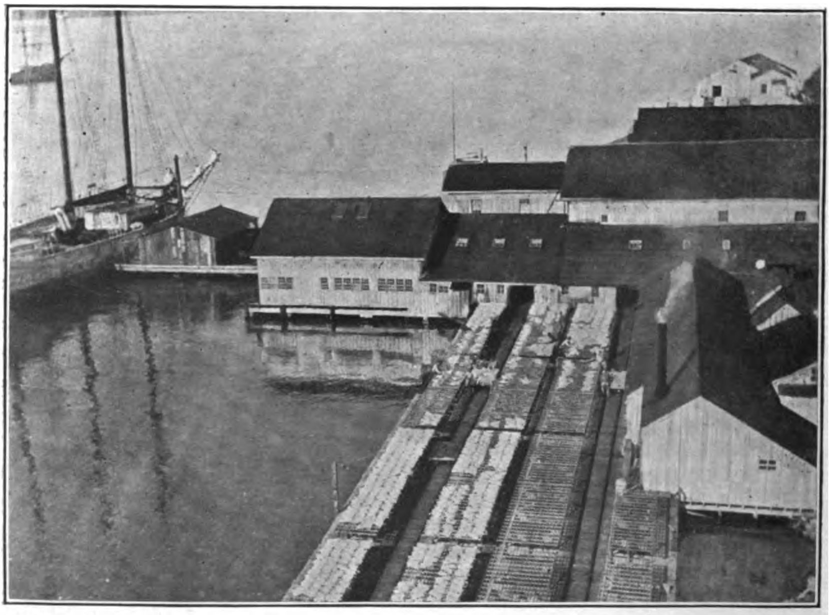

FIG. 2.—UNION FISH COMPANY'S HOME STATION AT UNION CITY, SAN FRANCISCO BAY, CAL.

10. The kenching in the storeroom should permit a circulation of air and not cause dead air spaces. The kench racks should be steamed or sprayed after each period of use.

11. The walls, posts, and floors should be sprayed often, once a week during the cool season and twice a week during the summer.

12. Treading the fish in drums should be prohibited. Workingmen coming in from the street in their dirty shoes obviously should not be allowed to tread the fish in the packing operation. A mechanical appliance would accomplish the same purpose in a cleanly manner.

13. The boxes used in carrying the fish from the storeroom to the skinning loft and from the tables to the cutters and packers should be washed each day.

14. The skinning or cutting tables should not have shelves or boxes beneath to catch bits of skin or fish. They should be well washed each evening. The simple brushing with a hand broom is not sufficient. The floor should be cleaned often.

15. All refuse should be removed from the room promptly. Bits of fish in barrels and boxes act only as incubators to perpetuate the infection.

16. The finished product should be held in a reasonably cool place in summer, and when shipped it should be handled under proper temperature conditions as are other meat products.

17. All new construction or remodeling should make ample provision for light. Many of the present structures are too dark.

18. All rubbish, as barrels, hoops, staves, waste, etc., should be removed from the flake yards and docks.

19. Concentrated sulphurous acid should be used as a disinfectant when steam is not available. One part of the acid to 50 parts of water is effectual where much reddening has occurred, and 1 part to 200 parts of water will be effective in preventing growth if used often.[a]

BROWN MOLD.

Brown mold, which forms brown, frecklelike spots on partly dried fish, occurs but rarely on this coast. It occurs usually on old fish, but may be found on comparatively fresh fish also. The fungus affects both sides of the fish, even covering the fins and tail. When it is found on comparatively fresh fish, they are scrubbed with a brush in running water, after which they are powdered. But little attention is paid to this fungus by the packers.

THE INDUSTRY IN 1915.

PERSONS EMPLOYED.

The following table shows the persons employed in the various branches of the industry and their nationality. California leads Washington in the total number of persons employed by a slight margin. The latter State leads, however, in the number of fishermen employed. The whites vastly outnumber the other employees, only 15 Indians and 16 Japanese being employed out of a total number of

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[a] United States Bureau of Chemistry Bulletin no. 133, p. 61–63.

919. Most of the Japanese are employed as cooks, while the Indians act as fishermen exclusively.

PERSONS EMPLOYED IN THE COD FISHERIES OF THE PACIFIC COAST IN 1915.

How engaged.	Alaska.	Washington.	California.	Total.
In vessel fisheries: Whites	47	268	255	570
In transporting: Whites	17		22	39
In shore and boat fisheries:				
Whites	143			143
Indians	16			16
Total	159			159
In shore work:				
Whites	22	59	95	176
Japanese	8	8		16
Total	30	67	95	192
Total:				
Whites	229	327	372	896
Indians	16			16
Japanese	8	8		16
Grand total	253	335	372	928

INVESTMENT.

Twenty-one vessels were engaged in fishing and 9 in transporting, while 11 launches, each under 5 net tons, and 533 boats were employed in all branches of the fisheries. Hand lines were used exclusively in the fishery. California leads in the total investment in the fishery, followed by Alaska and Washington in the order named. The high value of the investment in Alaska is due to the number of shore stations located there.

VESSELS, BOATS, APPARATUS, SHORE PROPERTY, AND CASH CAPITAL EMPLOYED IN THE COD FISHERIES OF THE PACIFIC COAST IN 1915.

Designation.	Alaska.		Washington.		California.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Vessels fishing	6	$47,500	8	$75,000	7	$95,000	21	$217,500
Tonnage	155		2,084		2,175		4,414	
Outfit		2,421		32,881		28,844		64,146
Vessels transporting	5	11,900			4	70,500	9	82,400
Tonnage	59				728		787	
Outfit		5,650				17,000		22,650
Launches under 5 tons	14	25,000			1	4,000	15	29,000
Boats	222	8,640	165	6,138	146	5,340	533	20,118
Apparatus:								
Vessel fisheries—Hand lines		124		797		608		1,529
Shore fisheries—Hand lines		422						422
Shore and accessory property		114,600		33,000		96,000		243,600
Cash capital		55,510		53,820		42,585		151,915
Total		271,767		201,636		359,877		833,280

PRODUCTS.

The total number of cod landed in 1915 amounted to 3,801,586, the second largest number ever landed in one year on the Pacific coast, with a round weight of 38,015,860 pounds. The cured weight of these fish amounted to 15,199,314 pounds, which had a value of $501,568 as delivered at the home ports. As the companies prepare and market their own fish in a dried, boneless, pickled, etc., condition, the ultimate returns received by the companies will be much larger than is shown in this table.

The vessel fisheries produced 10,934,284 pounds of cured products, valued at $360,322, while the shore fisheries produced 4,265,030 pounds, valued at $141,246.

Washington leads in the total quantity produced and the value of same, followed by California and Alaska in the order named. Nearly all of the shore stations operated in Alaska are owned by Californians.

PRODUCTS OF THE COD FISHERIES OF THE PACIFIC COAST IN 1915.

Fisheries.	Cod, dry-salted.				Cod tongues.		Cod oil.	
	Number.	Round weight.	Prepared weight.	Value.	Weight.	Value.	Weight.	Value.
VESSEL.		*Pounds.*	*Pounds.*		*Pounds.*		*Pounds.*	
Alaska	105,500	1,055,000	422,000	$13,926	....	....	....	....
Washington	1,374,571	13,745,710	5,498,284	180,934	30,000	$2,090	....	....
California	1,253,500	12,535,000	5,014,000	165,462	7,400	370	....	....
Total	2,733,571	27,335,710	10,934,284	360,322	37,400	2,460	....	....
SHORE.								
Alaska	[a] 1,068,015	10,680,150	4,265,030	141,246	18,000	900	825	$33
Total:								
Alaska	1,170,000	11,700,000	4,680,000	154,440	18,000	900	825	33
Washington	1,374,571	13,745,710	5,498,284	180,934	30,000	2,090	....	....
California	1,253,500	12,535,000	5,014,000	165,462	7,400	370	....	....
Grand total	3,801,586	38,015,860	15,199,314	501,568	55,400	3,360	[b] 825	33

[a] Includes 3,515 stockfish, with a round weight of 35,150 pounds and a prepared weight of 7,030 pounds, valued at $732.

[b] Represents 110 gallons.

THE FISHING FLEET IN 1915.

The following table shows a list of the vessels engaged in the cod-fishery during 1915, together with the names and home ports of the owners, the net tonnage of the vessels, and the number of fishermen, members of the dress gang, and others employed aboard the vessels, also the number of dories used in fishing:

THE PACIFIC COAST CODFISHING FLEET IN 1915.

Name.	Rig.	Owner.	Home port.	Net tonnage.	Crew.			Dories.
					Fishermen.	Dress gang.	Others.	
ALASKA.								
Nonpareil	Gas. s.	Alaska Codfish Co	Unga	31	6		2	6
Pirate	Gas. s.	Union Fish Co	Pirate Cove	30	6		2	6
Lettie	Gas. s.	And. Grosvold	Sand Point	28	6		2	6
Highland Queen	Gas. s.	Knute Knutson	N. W. Harbor	12	6		1	2
Challenge	Gas. s.	Roe & Pollett	Nome	35	6		2	6
Silver Wave	Gas. s.	do	do	19	6		2	6
Total				155	36		11	32
WASHINGTON.								
Azalea	Sch.	Matheson Fisheries Co.	Anacortes	327	23	12	3	23
Fanny Dutard	Sch.	do	do	252	22	11	3	22
Alice	Sch.	Robinson Fisheries Co.	do	220	21	12	3	21
Wawona	Sch.	do	do	413	25	14	3	25
Fortuna	Sch.	Northern Codfish Co.	Seattle	138	10	7	2	10
John A	Sch.	Pacific Coast Codfish Co.	do	235	20	12	3	20
Maid of Orleans	Sch.	do	do	171	12	8	3	12
Chas. R. Wilson	Sch.	do	do	328	23	13	3	23
Total				2,084	156	89	23	156
CALIFORNIA.								
Galilee	Sch.	Union Fish Co	San Francisco	328	24	14	3	24
Sequoia	Sch.	do	do	324	24	14	3	24
Vega	Sch.	do	do	233	14	10	3	14
Glendale	Sch.	Alaska Codfish Co	do	281	21	12	3	21
City of Papeete	Sch.	do	do	370	24	14	3	24
Maweema		do	do	392	24	14	3	24
Ottillie Fjerd	Sch.	Pacific States Trading Co.	do	247	15	10	3	15
Total				2,175	146	88	21	146
Grand total				4,414	338	177	55	334

THE TRANSPORTING FLEET IN 1915.

The following list shows the vessels employed in the transporting of fish from the various shore stations in Alaska and the carrying of supplies to or between those stations, together with the owners and home ports of same, also the net tonnage of these vessels and the number of persons employed on them.

TRANSPORTING VESSELS EMPLOYED IN THE CODFISHERIES OF THE PACIFIC COAST IN 1915.

Name.	Rig.	Owner.	Home port.	Net tonnage.	Crew.
ALASKA.					
Union Flag	Gas. s.	Union Fish Co	Pirate Cove	7	2
Pirate [a]	Gas. s.	do	do	30	3
Lena	Gas. s.	And. Grosvold	Sand Point	12	3
Nonpareil [a] [b]	Gas. s.	Alaska Codfish Co	Unga	31	3
Martha	Sch.	Union Fish Co	Pirate Cove	14	2
Volcano	Sch.	do	Pavlof	17	2
Pitti Sing	Sch.	A. Komedal	Unga	9	2
Total				120	17
CALIFORNIA.					
Golden State	Gas. s.	Union Fish Co	San Francisco	223	8
Allen A	Sch.	Alaska Codfish Co	do	266	6
Bertha Dolbeer	Sch.	Pacific States Trading Co	do	230	6
Union	Gas. s.	Union Fish Co	do	9	2
Total				728	22
Grand total				1,504	55

[a] Fished part of the year.

[b] Wrecked early in year.

ALASKA SHORE STATIONS OPERATED IN 1915.

The shore stations here noted were all operated during the year 1915. In addition there were in reserve the Eagle Harbor station of the Union Fish Co. and the Squaw Harbor station of Mr. John H. Nelson.

SHORE CODFISHING STATIONS OPERATED IN ALASKA IN 1915.

Name.	Island on which located.	Owner.	Headquarters.
Unga	Unga	Alaska Codfish Co	San Francisco.
Squaw Harbor	do	do	Do.
Kellys Rock	do	do	Do.
Company Harbor	Sannak	do	Do.
Moffets Cove	do	do	Do.
Dora Harbor	Unimak	do	Do.
Squaw Harbor	Unga	John H. Nelson	Unga, Alaska.
Hard Scratch	do	R. H. Johnson	Sand Point, Alaska.
Northwest Harbor	Herendeen	Pacific States Trading Co	San Francisco.
Pirate Cove	Popof	Union Fish Co	Do.
Northwest Harbor	Herendeen	do	Do.
Sanborn Harbor	Nagai	do	Do.
Unga	Unga	do	Do.
Pavlof Harbor	Sannak	do	Do.
Johnson Harbor	do	do	Do.
Dora Harbor	Unimak	do	Do.
Unga	Unga	A. Komedal	Unga, Alaska.

SUMMARY OF CATCH.

The following table gives a complete summary of all the codfish secured in the vessel and shore fisheries from the inception of the industry and carried to the home ports in Washington and California. No effort has been made to include the cod consumed locally in Alaska, which, in the aggregate, amounts to considerable, as it forms the principal article of diet along a considerable stretch of Alaska's coast line. This table shows that 54,052,993 fish were secured in the vessel fishery and 25,368,468 in the shore fishery, or a grand total of 79,421,461 fish.

Summary of Cod Catch.

Year.	Vessel fishery.	Shore fishery.	Total.	Year.	Vessel fishery.	Shore fishery.	Total.
	Number.	*Number.*	*Number.*		*Number.*	*Number.*	*Number.*
1863	7,100	....	7,100	1891	583,000	662,000	1,245,000
1864	54,500	....	54,500	1892	775,000	700,000	1,475,000
1865	225,000	....	225,000	1893	666,000	660,000	1,326,000
1866	724,000	....	724,000	1894	698,000	305,000	1,003,000
1867	943,400	....	943,400	1895	765,000	286,000	1,051,000
1868	580,000	....	580,000	1896	837,000	....	837,000
1869	1,032,000	....	1,032,000	1897	850,000	511,000	1,361,000
1870	1,467,000	....	1,467,000	1898	342,000	450,000	792,000
1871	926,000	....	926,000	1899	783,000	722,000	1,505,000
1872	305,000	....	305,000	1900	817,000	909,000	1,726,000
1873	563,000	....	563,000	1901	787,000	727,000	1,514,000
1874	369,000	....	369,000	1902	1,229,000	1,140,000	2,369,000
1875	362,000	....	362,000	1903	1,463,800	985,000	2,448,800
1876	814,000	30,000	844,000	1904	1,546,524	1,002,000	2,548,524
1877	779,000	101,000	880,000	1905	2,332,133	1,282,000	3,614,133
1878	902,000	227,000	1,127,000	1906	2,492,618	1,020,632	3,513,250
1879	1,301,000	198,000	1,499,000	1907	1,490,230	1,518,951	3,009,181
1880	1,002,000	201,000	1,203,000	1908	2,028,000	1,146,403	3,174,403
1881	907,000	154,000	1,061,000	1909	1,748,155	910,361	2,658,516
1882	1,038,000	203,000	1,241,000	1910	1,291,500	683,475	1,974,975
1883	1,485,000	235,000	1,720,000	1911	1,542,000	992,000	2,534,000
1884	1,373,000	249,000	1,622,000	1912	1,348,000	997,934	2,345,934
1885	988,000	386,000	1,374,000	1913	1,481,260	804,097	2,285,357
1886	800,000	383,000	1,183,000	1914	2,283,202	1,585,600	3,868,802
1887	827,000	299,000	1,126,000	1915	2,733,571	1,068,015	3,801,586
1888	674,000	372,000	1,046,000				
1889	327,000	489,000	816,000	Total	54,052,993	25,368,468	79,421,461
1890	365,000	773,000	1,138,000				

SUMMARY OF VESSEL-FISHING DATA.

The following table shows, in a summarized form, the available data covering the vessel fishery for cod on the Pacific coast from its inception in 1863 to 1915, inclusive. In this table is shown, by years, the number of vessels from the different States fishing on the various grounds, and the catch made on each ground. As separate data of the catches of the small vessels operating with the Alaska shore stations as their base have not been kept, it has not been possible to include these in this table, and they are merged into the shore-station data. The total catch of the fleet since 1863 amounts to 54,052,993 cod.

SUMMARY OF VESSEL FISHING, 1863 TO 1915.

CALIFORNIA VESSELS.

Years.	Number of vessels engaged.				Total net tonnage.	Number of fish caught.			
	Okhotsk Sea.	Bering Sea.	North Pacific.	Total.		Okhotsk Sea.	Bering Sea.	North Pacific.	Total.
1863........	1	....	....	1	120	7,100	....	....	7,100
1864........	1	1	....	2	....	50,000	4,500	....	54,500
1865........	6	....	1	7	449	210,000	....	15,000	225,000
1866........	....	....	3	18	....	588,000	....	136,000	724,000
1867........	....	....	....	20	....	....	....	....	943,400
1868........	7	....	3	10	1,502	377,000	....	203,000	580,000
1869........	....	....	....	21	....	....	....	....	1,032,000
1870........	12	....	10	22	....	1,027,000	....	440,000	1,467,000
1871........	5	....	8	13	....	532,000	....	394,000	926,000
1872........	2	....	4	6	....	130,000	....	175,500	305,500
1873........	5	....	5	10	....	352,000	....	211,000	563,000
1874........	....	....	7	7	....	....	....	369,000	369,000
1875........	....	....	5	5	506	....	....	362,000	362,000
1876........	3	....	8	11	....	333,000	....	481,000	814,000
1877........	5	....	6	11	....	426,000	....	353,000	779,000
1878........	4	....	6	10	....	651,000	....	251,000	902,000
1879........	5	....	7	12	1,858	843,000	....	458,000	1,301,000
1880........	6	....	1	7	1,441	915,000	....	87,000	1,002,000
1881........	5	....	2	7	1,441	764,000	....	143,000	907,000
1882........	5	2	6	13	2,260	712,000	132,000	194,000	1,038,000
1883........	7	5	2	14	2,837	983,000	381,000	121,000	1,485,000
1884........	11	3	....	14	3,222	1,007,000	366,000	....	1,373,000
1885........	4	3	3	10	2,287	493,000	296,000	199,000	988,000
1886........	4	2	2	8	1,989	428,000	239,000	133,000	800,000
1887........	2	1	4	7	1,558	331,000	185,000	311,000	827,000
1888........	2	2	2	6	1,391	311,000	294,000	69,000	674,000
1889........	2	....	....	2	623	327,000	....	....	327,000
1890........	2	1	....	3	715	317,000	48,000	....	365,000
1891........	1	5	....	6	1,232	171,000	387,000	....	558,000
1892........	1	4	....	5	1,335	125,000	487,000	....	612,000
1893........	2	3	1	6	1,460	341,000	215,000	....	556,000
1894........	1	4	....	5	1,393	169,000	420,000	....	589,000
1895........	2	4	....	6	1,518	248,000	405,000	....	653,000
1896........	1	5	....	6	1,512	125,000	493,000	....	618,000
1897........	....	5	....	5	1,393	....	554,000	....	554,000
1898........	....	3	....	3	780	....	292,000	....	292,000
1899........	....	5	....	5	1,174	....	580,000	....	580,000
1900........	....	6	....	6	1,305	....	623,000	....	623,000
1901........	....	6	....	6	1,540	....	702,000	....	702,000
1902........	....	9	....	9	2,034	....	933,000	....	933,000
1903........	1	7	....	8	1,899	170,000	867,300	....	1,037,300
1904........	1	5	1	7	1,989	223,000	779,000	60,200	1,062,200
1905........	4	7	....	11	2,928	636,000	700,133	....	1,336,133
1906........	5	6	....	11	3,237	692,000	786,000	....	1,478,000
1907........	4	4	....	8	2,400	271,800	470,000	....	741,800
1908........	3	4	....	7	2,259	420,000	490,000	....	910,000
1909........	1	4	....	5	1,416	80,000	520,000	....	600,000
1910........	....	3	....	3	1,074	....	380,000	....	380,000
1911........	....	3	....	3	993	....	439,000	....	439,000
1912........	....	4	1	5	1,554	....	525,000	139,000	664,000
1913........	....	4	1	5	1,554	....	587,000	130,000	717,000
1914........	....	5	1	6	1,783	....	781,202	150,000	931,202
1915........	....	6	1	7	2,175	....	1,134,500	119,000	1,253,500
Total.	....	....	....	....	....	15,785,900	16,486,635	5,712,700	39,960,635

SUMMARY OF VESSEL FISHING, 1863 TO 1915—Continued.

WASHINGTON VESSELS.

Years.	Number of vessels engaged.				Total net tonnage.	Number of fish caught.			
	Okhotsk Sea.	Bering Sea.	North Pacific.	Total.		Okhotsk Sea.	Bering Sea.	North Pacific.	Total.
1891	....	1	....	1	142	....	25,000	....	25,000
1892	....	2	....	2	210	....	163,000	....	163,000
1893	....	1	....	1	142	....	110,000	....	110,000
1894	....	1	....	1	142	....	109,000	....	109,000
1895	....	1	....	1	142	....	112,000	....	112,000
1896	....	2	....	2	508	....	219,000	....	219,000
1897	....	3	....	3	361	....	296,000	....	296,000
1898	....	1	....	1	89	....	50,000	....	50,000
1899	....	2	....	2	286	....	203,000	....	203,000
1900	....	2	....	2	286	....	194,000	....	194,000
1901	....	1	....	1	142	....	85,000	....	85,000
1902	....	3	....	3	368	....	[a]296,000	....	296,000
1903	....	3	1	4	490	....	[b]331,500	95,000	426,500
1904	....	6	....	6	599	....	[c]484,324	....	484,324
1905	....	9	....	10	1,610	....	[d]996,000	....	996,000
1906	....	5	3	8	1,425	....	734,618	280,000	1,014,618
1907	....	5	....	5	974	....	748,430	....	748,430
1908	....	7	1	8	1,622	....	1,008,000	110,000	1,118,000
1909	....	8	....	8	1,622	....	1,148,155	....	1,148,155
1910	....	6	....	6	1,249	....	911,500	....	911,500
1911	....	7	....	7	1,484	....	1,103,000	....	1,103,000
1912	....	5	1	6	1,251	....	[e]550,000	134,000	684,000
1913	....	5	1	6	1,604	....	624,260	140,000	764,260
1914	....	8	1	9	2,482	....	[f]1,143,000	209,000	1,352,000
1915	....	7	1	8	2,084	....	1,220,571	154,000	1,374,571
Total	....	....	....	....	....	....	12,865,358	1,122,000	13,987,358

[a] Includes catch by British Columbia schooner Blakeley (144 tons), 107,000 fish.
[b] Includes catch by British Columbia schooner Blakeley (144 tons), 115,000 fish.
[c] Includes catch by British Columbia schooner Blakeley (144 tons), 100,000 fish.
[d] Includes catch by British Columbia schooner Blakeley (144 tons), 78,000 fish.
[e] Includes catch by schooner Albert Meyer (398 tons), British Columbia, 260 fish.
[f] Includes catch by schooner Albert Meyer (398 tons), British Columbia, 100,000 fish.

NOTE.—In addition 6 Alaska vessels, with total net tonnage of 167, caught in the North Pacific 105,500 fish. These data have been included in the "Recapitulation."

RECAPITULATION.

Years.	Vessels.		Total number of fish caught.	Years.	Vessels.		Total number of fish caught.
	Total number.	Total net tonnage.			Total number.	Total net tonnage.	
1863	1	120	7,100	1891	7	1,374	583,000
1864	2	....	54,500	1892	7	1,545	775,000
1865	7	449	225,000	1893	7	1,602	666,000
1866	18	....	724,000	1894	6	1,535	698,000
1867	20	....	943,400	1895	7	1,660	765,000
1868	10	1,502	580,000	1896	8	2,020	837,000
1869	21	....	1,032,000	1897	7	1,754	850,000
1870	22	....	1,467,000	1898	2	869	342,000
1871	13	....	926,000	1899	7	1,460	783,000
1872	6	....	305,500	1900	7	1,591	817,000
1873	10	....	563,000	1901	7	1,682	787,000
1874	7	....	369,000	1902	12	2,402	1,229,000
1875	5	506	362,000	1903	12	2,389	1,463,800
1876	11	....	814,000	1904	13	2,538	1,546,524
1877	11	....	779,000	1905	21	4,538	2,332,133
1878	10	....	902,000	1906	19	4,662	2,492,618
1879	12	1,858	1,301,000	1907	13	3,374	1,490,230
1880	7	1,441	1,002,000	1908	15	3,881	2,028,000
1881	7	1,441	907,000	1909	13	3,038	1,748,155
1882	13	2,260	1,038,000	1910	9	2,323	1,291,500
1883	14	2,837	1,485,000	1911	10	2,477	1,542,000
1884	14	3,222	1,373,000	1912	10	2,805	1,848,000
1885	10	2,287	988,000	1913	11	3,158	1,481,260
1886	8	1,939	800,000	1914	15	4,265	2,263,202
1887	7	1,558	827,000	1915	21	4,426	2,628,071
1888	6	1,391	674,000				
1889	2	623	327,000	Total	....	....	58,947,993
1890	3	715	365,000				

DETAILED DATA OF THE FISHING FLEET FROM 1863 TO 1915.

The table following shows in detail the operations of the cod-fishing fleet from the inception of the industry in 1863 to 1915, inclusive. The name, rig, and net tonnage of each vessel, the dates of her departure and return, on what ground she fished, and the number of fish taken are all shown.[a] No detailed data are available for 1866 and 1869, while the individual vessel data for 1867 and 1868 are incomplete. From 1863 to 1890, both inclusive, the data relate to California exclusively. Owing to the variation in the weight of fish from the various grounds, and also the considerable variation in weight of fish from the same ground in different years, no effort has been made to show the weight of the catch, while the data on the prices realized are so fragmentary that this item also has been omitted, as it would be nothing but a guess at best.

Operations of the Cod Fleet by Years.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1863.						
CALIFORNIA.[b]						
Timandra [c]	Brig.	120			Okhotsk Sea	7,100
1864.						
Timandra	Brig.	120			Okhotsk Sea	50,000
Alert	Sch.				Bering Sea	4,500
Total						54,500
1865.						
Equity	Sch.	63			Okhotsk Sea	210,000
Flying Dart	Sch.	84			do	
H. L. Ruggles	Sch.	75			do	
J. D. Sanborn	Sch.	71			do	
Mary Cleveland	Sch.	91			do	
Taccon	Sch.	20			do	
Porpoise	Sch.	45	Mar. 27	July 7	Shumagin Islands [d]	15,000
Total		449				225,000
1867.						
Sanborn	Sch.				Shumagin Islands	64,000
Porpoise	Sch.				do	36,000
Sarah Louise	Sch.				do	36,000
Total						136,000
1868.						
Porpoise [e]	Sch.				Shumagin Islands	63,000
Mandrago	Sch.				do	85,000
Sanborn	Sch.				do	60,000
Total						208,000

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[a] For the data covering the San Francisco fleet from 1870 to 1914, inclusive, the writer is indebted to the Union Fish Co. (formerly the McCollam Fishing & Trading Co.), of San Francisco, which placed its invaluable records at his disposal.

[b] From 1863 to 1890, inclusive, data relate to California exclusively.

[c] Trading voyage.

[d] First fare from the Shumagins.

[e] Made two trips.

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1870.						
Clara R. Sutill					Okhotsk Sea	92,000
Constitution	Bkn.	257			do	18,000
Carib					do	92,000
Domingo	Bark.				do	95,000
Florence					do	85,000
Gold Hunter	Bark.				do	125,000
Legal Tender	Bark.				do	125,000
Union					do	100,000
Francisco					do	91,000
Witch Queen					do	62,000
Alaska	Bark.				do	102,000
Shooting Star	Bark.				do	40,000
Arizona					Shumagin Islands	55,000
Ann Eliza					do	20,000
Daisy					do	20,000
J. H. Roscoe	Sch.	79			do	65,000
Mary Zephyr					do	35,000
Porpoise	Sch.				do	38,000
Romp					do	32,000
Sarah Louise	Sch.				do	35,000
Scotland					do	55,000
Wild Gazelle	Sch.	114			do	85,000
Total						1,467,000
1871.						
Union					Okhotsk Sea	126,000
Legal Tender	Bark.				do	135,000
Gold Hunter	Bark.				do	125,000
Clara R. Sutill					do	66,000
Domingo	Bark.				do	80,000
Daisy					Shumagin Islands	15,000
Shooting Star					do	35,000
Alaska	Bark.				do	92,000
S. H. Merrill					do	85,000
Flying Mist					do	35,000
Scotland					do	46,000
Alfred Adams	Sch.	64			do	42,000
J. H. Roscoe	Sch.	79			do	44,000
Total						926,000
1872.						
Gold Hunter	Bark.				Okhotsk Sea	130,000
Scotland					do	
Legal Tender	Bark.				Shumagin Islands	25,000
J. H. Roscoe	Sch.	79			do	58,500
Wild Gazelle	Sch.	114			do	61,000
Flying Mist					do	31,000
Total						305,000
1873.						
Gold Hunter	Bark.		Apr. 13		Okhotsk Sea	125,000
Clara R. Sutill			Apr. 26		do	87,000
Page	Sch.	125	Apr. 19			76,000
Energy	Bark.		Apr. 10			64,000
Domingo	Bark.		May 15			
Wild Gazelle	Sch.	108	Apr. 19		Shumagin Islands	89,000
Alfred Adams	Sch.	64	Mar. 10		do	40,000
Flying Mist			Mar. 7		do	28,000
Alfred Adams	Sch.	64	July 5		do	30,000
Flying Mist			July 15		do	24,000
Total						563,000
1874.						
San Diego	Sch.	36	Apr. 12	July 22	Shumagin Islands	28,000
Energy	Bark.		Apr. 13	Aug. 23	do	80,000
Joseph Wooley	Sch.		Apr. 12	Sept. 5	do	90,000
Alfred Adams	Sch.	64	Apr. 15	Aug. 15	do	56,000
Wild Gazelle	Sch.	114	Apr. 23	Aug. 20	do	78,000
SanDiego	Sch.			Oct. 18	do	22,000
Page	Sch.	125		Oct. 11		15,000
Total						369,000

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1875.						
Undaunted	Sch.	68	Mar. 15		Shumagin Islands	46,000
Alfred Adams	Sch.	64	Mar. 29	Aug. 20	do	56,000
Wild Gazelle	Sch.	108	Apr. 16	Sept. 3	do	93,000
Dashing Wave	Sch.	141	Apr. 18		do	95,000
Page	Sch.	125				72,000
Total		506				362,000
1876.						
Alfred Adams	Sch.	64	Jan. 9	July 3	Shumagin Islands	62,000
Alaska	Sch.	32	Mar. 9	July 6	do	28,000
Do			July 19		do	70,000
Selma			Mar. 9	July 1	do	70,000
Page	Sch.	125	Apr. 1	Aug. 19	do	73,000
Energy	Bark.		Aug. 15	do	do	65,000
San Diego	Sch.	36		Aug. 10	do	19,000
Wild Gazelle	Sch.	114	Apr. 12	Sept. 20	do	94,000
Hesperian			Apr. 7	Oct. 11	Okhotsk Sea	150,000
Josephine	Brig.	207	Apr. 12	do	do	130,000
Constitution	Bkn.	257	June 20		do	53,000
Total						814,000
1877.						
Page	Sch.	125	Apr. 17	Aug. 17	Okhotsk Sea	62,000
Constitution	Bkn.	257	Apr. 21	Sept. 14	do	133,000
Fremont	Bkn.	345	Apr. 22	do	do	208,000
Brontes			Apr. 25	Lost		
Alaska	Sch.	32	Mar. 25	Sept. 11	Shumagin Islands	16,000
J. H. Roscoe	Sch.	79	Apr. 28	Aug. 4	do	61,000
Energy	Bark.		do	Aug. 30	do	70,000
Alfred Adams	Sch.	64	Apr. 4	June 17	do	67,000
Do			June 29	Aug. 25	do	44,000
Wild Gazelle	Sch.	114	Apr. 6	Sept. 4	do	95,000
Pato [a]	Sch.	45	Mar. —		Okhotsk Sea	23,000
Total						779,000
1878.						
General Miller	Sch.	108	May 18	Sept. 25	Shumagin Islands	23,000
J. H. Roscoe	Sch.	79	Apr. 9	Aug. 30	do	20,000
May Queen	Sch.		Apr. 3	Aug. 7	do	75,000
Sarah	Sch.	165	Mar. 29	Aug. 24	do	78,000
Three Sisters [b]	Sch.	62			do	35,000
Wild Gazelle	Sch.	114	Apr. 6	Aug. 30	do	20,000
Adelaide Cooper	Bark.	300	Apr. 16	Oct. 2	Okhotsk Sea	216,000
Constitution	Bkn.	257	Apr. 11	Sept. 12	do	140,000
Fremont	Bkn.	345	Apr. 20	Sept. 29	do	250,000
Page	Sch.	125	Apr. 9	Sept. 10	do	45,000
Total						902,000
1879.						
Wild Gazelle	Sch.	114	Apr. 2	Sept. 20	Shumagin Islands	85,000
Sarah	Sch.	165	Mar. 16	Aug. 4	do	71,000
Undaunted	Sch.	68	Mar. 15	June 21	do	63,000
H. L. Tiernan	Sch.	145	May 3	Sept. 10	do	97,000
General Miller	Sch.	108	Apr. 3	Sept. 21	do	80,000
Alaska	Sch.	32	Mar. 11	Sept. 10	do	10,000
J. H. Roscoe	Sch.	79	Feb. 28	Aug. 1	do	52,000
Adelaide Cooper	Bark.	300		Sept. 28	Okhotsk Sea	225,000
Fremont	Bkn.	345		Oct. 1	do	240,000
Constitution	Bkn.	257		Sept. 21	do	205,000
Page	Sch.	125	May 12	Oct. 8	do	40,000
Glencoe	Brig.	169		Nov. 7	do	133,000
Total		1,847				1,301,000

[a] Sailed from Hongkong, China, and landed cargo at Portland, Oreg.; the only cargo of cod ever landed here.

[b] Lost.

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1880.						
Wild Gazelle	Sch.	114	Apr. 8	Aug. 23	Shumagin Islands	87,000
Arago	Sch.	176	May 2	Sept. 20	Okhotsk Sea	125,000
Page	Sch.	109	May 8	Sept. 4	do	60,000
Glencoe	Brig.	169	May 1	Oct. 28	do	120,000
Fremont	Bkn.	328	May 6	Oct. 10	do	220,000
Constitution	Bkn.	276	May 8	Oct. 28	do	165,000
San Luis	Bkn.	275	May 17	Oct. 4	do	225,000
Total		1,441				1,002,000
1881.						
Wild Gazelle	Sch.	114	Apr. 1	Aug. 28	Shumagin Islands	75,000
Page	Sch.	109	Apr. 23	Sept. 12	do	68,000
Arago	Sch.	176	Apr. 27	Sept. 11	Okhotsk Sea	90,000
Constitution	Bkn.	276	do	Oct. 17	do	185,000
Glencoe	Brig.	169	Apr. 29	Oct. 15	do	103,000
Fremont	Bkn.	328	Apr. 30	Sept. 18	do	201,000
San Luis	Bkn.	275	May 6	Oct. 15	do	185,000
Total		1,441				907,000
1882.						
Ariel	Sch.	94	Mar. 18	Aug. 18	Shumagin Islands	49,000
Page	Sch.	109	Mar. 20	Aug. 24	do	31,000
General Miller	Sch.	108	do	Lost	do	
H. L. Tiernan	Sch.	142	Apr. 5	Ashore	do	
Dashing Wave	Sch.	141	Apr. 29	Sept. 19	do	60,000
Adrianna	Sch.	95	May 8	July 6	do	54,000
Isabel	Sch.	175	May 12	Sept. 1	Bering Sea	50,000
Tropic Bird	Brig.	172	Apr. 28	Sept. 25	do	82,000
Arago	Sch.	176	Apr. 15	Sept. 28	Okhotsk Sea	111,000
San Luis	Bkn.	275	Apr. 29	Oct. 9	do	185,000
Glencoe	Brig.	169	May 4	Oct. 17	do	72,000
Fremont	Bkn.	328	May 6	Sept. 28	do	204,000
Constitution	Bkn.	276	May 13	Oct. 13	do	140,000
Total		2,260				1,038,000
1883.						
W. H. Stevens	Sch.	139	Apr. 21	July 27	Shumagin Islands	77,000
Dashing Wave	Sch.	141	May 7	Sept. 21	do	44,000
John Hancock	Sch.	167	Mar. 29	Aug. 22	Bering Sea	75,000
Francis Alice	Sch.	125	do	do	do	60,000
Bonanza	Sch.	128	Apr. 14	do	do	52,000
Tropic Bird	Brig.	172	Mar. 29	do	do	89,000
Isabel	Sch.	175	Apr. 2	Sept. 19	do	105,000
Arago	Sch.	176	Apr. 16	Oct. 5	Okhotsk Sea	96,000
Hera	Sch.	369	Apr. 20	Oct. 19	do	188,000
San Luis	Bkn.	275	Apr. 24	Oct. 15	do	150,000
Constitution	Bkn.	276	do	Oct. 6	do	150,000
Glencoe	Brig.	169	Apr. 25	Oct. 27	do	95,000
Fremont	Bkn.	328	Apr. 28	Sept. 19	do	186,000
Una	Sch.	197	Apr. 30	Oct. 3	do	118,000
Total		2,837				1,485,000
1884.						
Dashing Wave	Sch.	141	Mar. 22	Aug. 25	Bering Sea	85,000
John Hancock	Sch.	167	Mar. 23	July 27	do	96,000
Helen W. Almy	Bark.	298	Apr. 2	Sept. 5	do	185,000
Hera	Sch.	369	Apr. 9	Oct. 3	Okhotsk Sea	135,000
Arago	Sch.	176	Apr. 11	Oct. 7	do	80,000
Isabel	Sch.	175	Apr. 13	Oct. 4	do	90,000
W. H. Meyer	Brig.	256	Apr. 18	Oct. 9	do	90,000
Tropic Bird	Brig.	172	Apr. 20	Oct. 6	do	82,000
Jane A. Falkenburg	Bkn.	295	do	Oct. 3	do	136,000
San Luis	Bkn.	275	Apr. 26	do	do	90,000
Constitution	Bkn.	276	do	Oct. 6	do	104,000
Fremont	Bkn.	328	May 2	Oct. 1	do	118,000
Glencoe	Brig.	169	May 5	Oct. 27	do	42,000
Francis Alice	Sch.	125		Oct. 25	do	40,000
Total		3,222				1,373,000

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1885.						
Arago	Sch.	176	Mar. 27	Sept. 11	Shumagin Islands	50,000
John Hancock	Sch.	167	Apr. 1	Aug. 2	....do	64,000
Isabel	Sch.	175	Apr. 18	Aug. 27	....do	85,000
Helen W. Almy	Bark.	298	...do...	Sept. 5	Bering Sea	182,000
Constitution	Bkn.	276	Apr. 22	Oct. 9	Okhotsk Sea	120,000
Tropic Bird	Brig.	172	Apr. 25	Sept. 18	Bering Sea	79,000
Francis Alice	Sch.	125	Apr. 28	Aug. 10	....do	35,000
San Luis	Bkn.	275	Apr. 30	Oct. 16	Okhotsk Sea	118,000
Fremont	Bkn.	328	May 2	Oct. 8	....do	135,000
Jane A. Falkenburg	Bkn.	295	May 3	Sept. 25	....do	120,000
Total		2,287				988,000
1886.						
Isabel	Sch.	175	Apr. 1	Aug. 11	Shumagin Islands	92,000
Francis Alice	Sch.	125	Apr. 3	July 15	Bering Sea	69,000
John Hancock	Sch.	167	Apr. 13	Aug. 6	Shumagin Islands	41,000
Helen W. Almy	Bark.	298	...do...	Sept. 15	Bering Sea	170,000
Fremont	Bkn.	328	Apr. 23	Oct. 4	Okhotsk Sea	141,000
Constitution	Bkn.	276	May 4	Oct. 1	....do	84,000
San Luis	Bkn.	275	May 9	Oct. 7	....do	102,000
Jane A. Falkenburg	Bkn.	295	May 21	Oct. 5	....do	101,000
Total		1,939				800,000
1887.						
John Hancock	Sch.	167	Mar. 20	July 12	Shumagin Islands	76,000
Isabel	Sch.	175	Mar. 26	Aug. 25	....do	80,000
Dashing Wave	Sch.	141	Apr. 6	Aug. 29	....do	79,000
Arago	Sch.	176	Apr. 24	Sept. 4	....do	76,000
Constitution	Bkn.	276	Apr. 12	Aug. 12	Bering Sea	185,000
Fremont	Bkn.	328	May 4	Sept. 19	Okhotsk Sea	180,000
Jane A. Falkenburg	Bkn.	295	May 29	Oct. 5	....do	151,000
Total		1,558				827,000
1888.						
Dashing Wave	Sch.	141	Mar. 16	July 21	Shumagin Islands	69,000
Arago	Sch.	176	Apr. 12	Sept. 2	Bering Sea	103,000
Constitution	Bkn.	276	Apr. 25	Aug. 29	....do	191,000
Fremont	Bkn.	328	May 1	Sept. 19	Okhotsk Sea	175,000
Jane A. Falkenburg	Bkn.	295	May 10	Sept. 23	....do	136,000
Isabel	Sch.	175		(a)	Shumagin Islands	
Total		1,391				674,000
1889.						
Fremont	Bkn.	328	May 6	Sept. 25	Okhotsk Sea	170,000
Jane A. Falkenburg	Sch.	295	May 23	...do....	....do	157,000
Total		623				327,000
1890.						
Vanderbilt	Sch.	92	Apr. 13	Aug. 4	Bering Sea	48,000
Jane A. Falkenburg	Sch.	295	May —	Oct. 3	Okhotsk Sea	140,000
Fremont	Bkn.	328	May 17	Oct. 6	....do	177,000
Total		715				365,000
1891.						
CALIFORNIA.						
Francis Alice	Sch.	125	Jan. 11	July 7	Bering Sea	70,000
Dashing Wave	Sch.	141	Mar. 16	Apr. 16[a]		
Arago	Sch.	176	Apr. 16	Aug. 28	Bering Sea	87,000
Jane A. Falkenburg	Sch.	295	Apr. 25	Sept. 1	....do	160,000
Fremont	Bkn.	328	May 6	Sept. 23	Okhotsk Sea	171,000
John Hancock	Sch.	167	June 10	Sept. 9	Bering Sea	70,000
Total		1,232				558,000

[a] Lost.

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1891.						
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	25,000
1892.						
CALIFORNIA.						
Arago	Sch.	176	Apr. 10	Aug. 31	Bering Sea	90,000
Jane A. Falkenburg	Sch.	295	Apr. 27	Sept. 12	do	152,000
Fremont	Sch.	328	Apr. 28	Sept. 22	do	175,000
John Hancock	Sch.	167	May 6	Aug. 31	do	70,000
Hera	Sch.	369	May 19	Oct. 11	Okhotsk Sea	125,000
Total		1,335				612,000
WASHINGTON.						
Lizzie Colby	Sch.	142	Mar. 17	Aug. 30	Bering Sea	108,000
Moonlight	Sch.	68	Mar. 5	Aug. 20	do	55,000
Total		210				163,000
1893.						
CALIFORNIA.						
John Hancock	Sch.	167	Feb. 3	Mar. 7[a]		
Francis Alice	Sch.	125	Feb. 24		Shumagin Islands	
Arago	Sch.	176	Apr. 11	Aug. —	Bering Sea	90,000
Jane A. Falkenburg	Sch.	295	Apr. 20	Sept. 9	do	125,000
Hera	Sch.	369	Apr. 22	Sept. 26	Okhotsk Sea	166,000
Fremont	Sch.	328	Apr. 29	Sept. 10	do	175,000
Total		1,460				556,000
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	110,000
1894.						
CALIFORNIA.						
Arago	Sch.	176	Mar. 29	Sept. 6	Bering Sea	90,000
Fremont	Bkn.	328	Mar. 31	Aug. 26	do	180,000
Jane A. Falkenburg	Sch.	295	do	Aug. 27	do	105,000
Hera	Sch.	369	Apr. 19	Sept. 10	Okhotsk Sea	169,000
Uranus	Sch.	225	Apr. 12	Sept. 16	Shumagin Islands and Bering Sea.	45,000
Total		1,393				589,000
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	100,000
1895.						
CALIFORNIA.						
Fremont	Bkn.	328	Apr. 15	July 18	Bering Sea	159,000
Arago	Sch.	176	Apr. 17	July 20	Okhotsk Sea	89,000
Uranus	Sch.	225	Apr. 21	Aug. 11	Bering Sea	88,000
Jane A. Falkenburg	Sch.	295	Apr. 22	July 19	do	107,000
Hera	Sch.	369	Apr. 25	Sept. 17	Okhotsk Sea	159,000
Francis Alice	Sch.	125			Bering Sea	51,000
Total		1,518				653,000
WASHINGTON.						
Lizzie Colby	Sch.	142	Apr. 18	Aug. 9	Bering Sea	112,000

[a] Lost.

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1896.						
CALIFORNIA.						
Uranus	Sch.	225	Apr. 5	July 23	Bering Sea	81,000
La Ninfa	Sch.	119	Apr. 7	Sept. 2	do	50,000
Jane A. Falkenburg	Sch.	295	Apr. 11	Aug. 3	do	115,000
Fremont	Bkn.	328	Apr. 15	Aug. 5	do	167,000
Arago	Sch.	176	do	July 20	do	80,000
Hera	Sch.	369	Apr. 26	Sept. 9	Okhotsk Sea	125,000
Total		1,512				618,000
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	109,000
Emma F. Harriman [a]	Bark.	366	Apr. 8	Sept. 13	do	110,000
Total		508				219,000
1897.						
CALIFORNIA.						
Arago	Sch.	176	Mar. 30	July 15	Bering Sea	90,000
Fremont	Bkn.	328	Apr. 2	Sept. 8	do	167,000
Jane A. Falkenburg	Sch.	295	do	Sept. 9	do	124,000
Hera	Sch.	369	Apr. 4	Sept. 13	do	133,000
Uranus	Sch.	225	Apr. 26	Aug. 21	do	40,000
Total		1,393				554,000
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	114,000
Blakeley	Bgn.	144			do	100,000
Swan	Sch.	75			do	55,000
Total		361				269,000
1898.						
CALIFORNIA.						
Fremont	Bkn.	328	Apr. 5	Aug. 31	Bering Sea	152,000
Anna	Sch.	227		Oct. 2	do	95,000
Uranus	Sch.	225	May 9	Sept. 22	do	45,000
Total		780				292,000
WASHINGTON.						
Lizzie S. Sorrenson	Sch.	89			Bering Sea	50,000
1899.						
CALIFORNIA.						
Anna	Sch.	227	Mar. 30	Aug. 16	Bering Sea	117,000
Fremont	Bkn.	328	Apr. 1	Sept. 17	do	157,000
Arago	Sch.	176	Apr. 2	Sept. 13	do	80,000
Uranus	Sch.	225	Apr. 5	Aug. 25	do	83,000
Czarina	Sch.	218	Apr. 19	Oct. 1	do	143,000
Total		1,174				580,000
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	93,000
Blakeley	Bgn.	144			do	110,000
Total		286				203,000

[a] Cargo was taken to San Francisco and sold there.

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1900.						
CALIFORNIA.						
Stanley	Sch.	253	Apr. 3	Sept. 1	Bering Sea	154,000
Fremont	Bkn.	328	...do	Aug. 30	....do	160,000
Abbie M. Deering	Sch.	96	Apr. 10	July 1	....do	45,000
Anna	Sch.	227	Apr. 9	Aug. 24	....do	95,000
Arago	Sch.	176	Apr. 13	Sept. 18	....do	80,000
Uranus	Sch.	225	Mar. 26	Sept. 13	....do	89,000
Total		1,305				623,000
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	100,000
Blakeley	Bgn.	144			....do	94,000
Total		286				194,000
1901.						
CALIFORNIA.						
Uranus	Sch.	225	Mar. 27	July 7	Bering Sea	53,000
Fremont	Bkn.	328	Apr. 2	Aug. 18	....do	177,000
Harriet G	Brig.	188	Apr. 3	Sept. 7	....do	51,000
Stanley	Sch.	253	Apr. 11	Sept. 27	....do	195,000
City of Papeete	Bkn.	370	Apr. 13	Sept. 7	....do	151,000
Arago	Sch.	176	Apr. 16	Sept. 11	....do	75,000
Total		1,540				702,000
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	85,000
1902.						
CALIFORNIA.						
Stanley	Sch.	253	Mar. 22	Aug. 25	Bering Sea	166,000
Fremont	Bkn.	328	Apr. 1	Aug. 18	....do	183,000
Uranus	Sch.	225	...do	Aug. 15	....do	51,000
Arago	Sch.	176	Apr. 4	Sept. 28	....do	72,000
Harriet G	Brig.	188	...do	Aug. 26	....do	135,000
City of Papeete	Bkn.	370	Apr. 11	Aug. 29	....do	217,000
Mary and Ida	Sch.	174	...do	Aug. 21	....do	102,000
J. G. Wall	Sch.	93	June 15	Sept. 8	....do	7,000
Anna [a]	Sch.	227				
Total		2,034				933,000
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	104,000
Carrier Dove	Sch.	82			....do	85,000
Total		224				189,000
BRITISH COLUMBIA.						
Blakeley	Bgn.	144			Bering Sea	107,000
1903.						
CALIFORNIA.						
Mary and Ida	Sch.	174	Mar. 20	Aug. 23	Bering Sea	105,000
Arago	Sch.	176	Mar. 22	July 29	....do	75,000
Fremont	Bkn.	328	Mar. 28	Sept. 2	....do	179,000
Uranus	Sch.	225	Apr. 1	Aug. 21	....do	76,300
City of Papeete	Bkn.	370	...do	Aug. 12	....do	200,000
Harriet G	Brig.	188	Apr. 2	Aug. 29	....do	112,000
Emma Claudina	Sch.	185	Apr. 9	...do	....do	120,000
Stanley	Sch.	253	Apr. 21	Sept. 18	Okhotsk Sea	170,000
Total		1,899				1,037,300

[a] Lost in Bering Sea.

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1903.						
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	84,500
Carrier Dove	Sch.	82			North Pacific[a]	95,000
Nellie Colman	Sch.	122			Bering Sea	132,000
Total		346				311,500
BRITISH COLUMBIA.						
Blakeley	Bgn.	144		Sept. 15	Bering Sea	115,000
1904.						
CALIFORNIA.						
Arago	Sch.	176	Mar. 31	July 13	Shumagin Islands	69,200
Uranus	Sch.	225	...do	Sept. 12	Bering Sea	60,000
Harriet G	Brig.	188	...do	Sept. 1	...do	140,000
Stanley	Sch.	253	Apr. 3	Sept. 10	...do	165,000
Fremont	Bkn.	328	Apr. 7	...do	...do	193,000
City of Papeete	Bkn.	370	Apr. 11	...do	...do	212,000
Metha Nelson	Sch.	399	May 15	Oct. 11	Okhotsk Sea	223,000
Total		1,939				1,062,200
WASHINGTON.						
Lizzie Colby	Sch.	142			Bering Sea	98,000
Alice	Sch.	220			...do	128,324
Ida May	Sch.	33			...do	14,000
Nellie Colman	Sch.	122		July 27	...do	97,000
Carrier Dove	Sch.	82		...do	...do	47,000
Total		599				384,324
BRITISH COLUMBIA.						
Blakeley	Bgn.	144		Sept. —	Bering Sea	100,000
1905.						
CALIFORNIA.						
Zampa	Sch.	322	Mar. 30	Sept. 8	Bering Sea	125,133
Glen	Sch.	121	Apr. 8	Aug. 24	...do	65,000
John F. Miller	Sch.	170	Apr. 1	Aug. 25	...do	75,000
Harriet G	Sch.	188	Mar. 30	Sept. 3	...do	110,000
Stanley	Sch.	253	Mar. 26	Sept. 5	...do	135,000
Fremont	Bkn.	328	Mar. 30	Sept. 14	...do	190,000
John D. Spreckles	Bkn.	253	May 5	Sept. 29	Okhotsk Sea	133,000
S. N. Castle	Bgn.	464	Apr. 27	Sept. 27	...do	210,000
W. H. Dimond	Sch.	376	...do	...do	...do	150,000
City of Papeete	Bkn.	370	...do	Oct. 7	...do	143,000
Pearl	Sch.	83	(b)		Bering Sea	
Total		2,928				1,336,133
WASHINGTON.						
Harold Blekum	Sch.	185	Mar. 13	Aug. 23	Bering Sea	123,000
Ida May	Sch.	33	Apr. 20	July 5	...do	10,000
Nellie Colman	Sch.	122	Apr. 18	Aug. 12	...do	50,000
Carrier Dove	Sch.	82	Apr. 1	...do	...do	40,000
Joseph Russ	Sch.	235	Apr. 8	Aug. 31	...do	164,000
Alice	Sch.	220	Apr. 1	Aug. 21	...do	173,000
Fanny Dutard	Sch.	252	Apr. 15	Sept. 4	...do	195,000
Lizzie Colby	Sch.	142	Apr. 10	Aug. 15	...do	103,000
Falcon	Sch.	195	May 9	Sept. 1	...do	60,000
Total		1,466				918,000
BRITISH COLUMBIA.						
Blakeley	Bkn.	144	Apr. 15	Sept. 20	Bering Sea	78,000

[a] Virtually the same ground as the Shumagin Islands.

[b] Lost.

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1906.						
CALIFORNIA.						
W. H. Dimond	Sch.	376	Apr. 4	Oct. 3	Okhotsk Sea	140,000
Zampa	Sch.	322	Apr. 9	Oct. 10	Bering Sea	160,000
City of Papeete	Bkn.	370	Apr. 11	...do	.....do	181,000
Fremont	Bkn.	328	Mar. 16	Sept. 9	Okhotsk Sea	159,000
Stanley	Sch.	263	Apr. 4	Sept. 2	Bering Sea	140,000
Harriet G	Brig.	188	Mar. 15	Sept. 4	Okhotsk Sea	141,000
John D. Spreckles	Sch.	263	Mar. 22	...do	Bering Sea	80,000
S. N. Castle	Bkn.	464	Apr. 8	Sept. 24	Okhotsk Sea	219,000
Glen	Sch.	121	Mar. 25	Sept. 4	Bering Sea	85,000
Ottillie Fjord	Sch.	247	Mar. 28	Sept. 9	.....do	140,000
Dora Bluhm	Sch.	315	May 2	Sept. 11	Okhotsk Sea	33,000
Total		3,237				1,478,000
WASHINGTON.						
Carrier Dove	Sch.	82	Apr. 3	Sept. 10	North Pacific	48,000
Fanny Dutard	Sch.	252	Apr. 10	Aug. 30	Bering Sea	196,000
Lizzie Colby	Sch.	142	Apr. 14	Aug. 23	.....do	107,000
Maid of Orleans	Sch.	171	Apr. 24	Sept. 10	North Pacific	120,000
Harold Blekum	Sch.	185	Mar. 10	Aug. 14	.....do	112,000
Fortuna	Sch.	138	Apr. 18	Aug. 4	Bering Sea	70,000
Joseph Russ	Sch.	235	Mar. 20	Aug. 19	.....do	197,007
Alice	Sch.	220	Mar. 27	Aug. 17	.....do	162,611
Total		1,425				1,014,618
1907.						
CALIFORNIA.						
City of Papeete	Bkn.	370	Apr. 10	Sept. 29	Bering Sea	120,000
Stanley	Sch.	253	Mar. 22	Aug. 31	Okhotsk Sea	140,000
Fremont	Bkn.	328	Apr. 24	Sept. 29	.....do	108,000
John D. Spreckles	Sch.	263	Apr. 10	July 22	.....do	5,800
S. N. Castle	Bkn.	464	Apr. 18	July 14	.....do	18,000
Ottillie Fjord	Sch.	247	Mar. 28	Sept. 14	Bering Sea	135,000
John F. Miller	Sch.	170	Apr. 7	Aug. 29	.....do	90,000
Dora Bluhm	Sch.	315	Apr. 14	Sept. 20	.....do	125,000
Total		2,400				741,800
WASHINGTON.						
Fanny Dutard	Sch.	252	Apr. 26	Sept. 16	Bering Sea	180,000
Carrier Dove	Sch.	82	Mar. 20	...do	.....do	98,500
Harold Blekum	Sch.	185	Mar. 19	Aug. 22	.....do	113,000
Alice	Sch.	220	Apr. 15	Sept. 2	.....do	165,000
Joseph Russ	Sch.	235	...do	Aug. 22	.....do	191,930
Total		974				748,430
1908.						
CALIFORNIA.						
W. H. Dimond	Sch.	376	Apr. 9	Oct. 18	Bering Sea	138,000
City of Papeete	Bkn.	370	Mar. 21	Aug. 24	Okhotsk Sea	118,000
Stanley	Sch.	253	Mar. 13	Sept. 16	.....do	152,000
Fremont	Bkn.	328	Mar. 21	...do	.....do	150,000
Ottillie Fjord	Sch.	247	Mar. 28	Sept. 4	Bering Sea	125,000
Dora Bluhm	Sch.	315	Apr. 18	Oct. 16	.....do	120,000
City of Papeete	Bkn.	370	Mar. 21	Aug. 24	.....do	107,000
Total		2,250				910,000
WASHINGTON.						
Fanny Dutard	Sch.	252	Apr. 5	Sept. 6	Bering Sea	160,000
Harriet G	Brig.	188	Apr. 18	Sept. 15	.....do	115,000
Maid of Orleans	Sch.	171	Apr. 15	Aug. 26	.....do	102,000
Harold Blekum	Sch.	185	Mar. 31	Sept. 3	.....do	170,000
Vega	Sch.	233	Apr. 5	...do	.....do	102,000
Fortuna	Sch.	138	Apr. 13	Aug. 11	North Pacific	110,000
Alice	Sch.	220	Mar. 28	Aug. 23	Bering Sea	165,000
Joseph Russ	Sch.	235	...do	Aug. 24	.....do	194,000
Total		1,622				1,118,000

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1909.						
CALIFORNIA.						
John D. Spreckles	Sch.	253	Mar. 18	Sept. 8	Bering Sea	115,000
City of Papeete	Bkn.	370	Apr. 15	Sept. 2	do	155,000
Czarina	Sch.	218	Mar. 25	Sept. 8	do	115,000
Ottillie Fjord	Sch.	247	Mar. 28	Sept. 5	do	135,000
Fremont	Bkn.	328	Apr. 14	Oct. 4	Okhotsk Sea	80,000
Total		1,416				600,000
WASHINGTON.						
Fanny Dutard	Sch.	252	Apr. 8	Sept. 7	Bering Sea	170,000
Harriet G	Sch.	188	do	Sept. 13	do	122,000
Maid of Orleans	Sch.	171	do	Aug. 20	do	115,000
Harold Blekum	Sch.	185	Mar. 28	Aug. 13	do	110,000
Vega	Sch.	233	Apr. 8	Sept. 7	do	155,000
Fortuna	Sch.	138	Apr. 7	Aug. 16	do	102,000
Alice	Sch.	220	Apr. 8	do	do	170,000
Joseph Russ	Sch.	235	do	Aug. 24	do	204,155
Total		1,622				1,148,155
1910.						
CALIFORNIA.						
W. H. Dimond	Sch.	376	Mar. 3	Sept. 16	Bering Sea	150,000
City of Papeete	Bkn.	370	Mar. 26	Sept. 15	do	120,000
Fremont	Bkn.	328	Mar. 25	Oct. 1	do	110,000
Total		1,074				380,000
WASHINGTON.						
Fanny Dutard	Sch.	252	Apr. 20	Sept. 5	Bering Sea	185,500
Alice	Sch.	220	Apr. 21	Sept. 15	do	175,000
Joseph Russ	Sch.	235	Apr. 17	Sept. 12	do	180,000
Maid of Orleans	Sch.	171	Apr. 15	Aug. 15	do	116,000
Vega	Sch.	233	Apr. 14	Sept. 15	do	150,000
Fortuna	Sch.	138	Apr. 15	Sept. 4	do	105,000
Total		1,249				911,500
1911.						
CALIFORNIA.						
W. H. Dimond	Sch.	376	Mar. 28	Sept. 6	Bering Sea	176,000
City of Papeete	Bkn.	370	Mar. 25	Aug. 31	do	180,000
Ottillie Fjord	Sch.	247	Mar. 31	Sept. 7	do	83,000
Total		993				439,000
WASHINGTON.						
Fanny Dutard	Sch.	252	Apr. 14	Aug. 23	Bering Sea	201,000
Alice	Sch.	220	Mar. 30	Sept. 13	do	170,000
Joseph Russ	Sch.	235	Apr. 1	Aug. 23	do	204,000
John A	Sch.	235	Apr. 20	Sept. 6	do	165,000
Fortuna	Sch.	138	Mar. 31	Aug. 10	do	130,000
Vega	Sch.	233	Apr. 11	Sept. 19	do	165,000
Maid of Orleans	Sch.	171	Apr. 15	Sept. 7	do	68,000
Total		1,484				1,103,000
1912.						
CALIFORNIA.						
Vega	Sch.	233	Apr. 18	Sept. 17	North Pacific	139,000
W. H. Dimond	Sch.	376	Mar. 25	Aug. 29	Bering Sea	180,000
City of Papeete	Sch.	370	Mar. 28	Aug. 23	do	180,000
Ottillie Fjord	Sch.	247	Mar. 23	Sept. 5	do	75,000
Galilee	Sch.	328	Mar. —	Sept. 19	do	90,000
Total		1,554				664,000

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1912.						
WASHINGTON.						
Maid of Orleans	Sch.	171	Apr. 12	Aug. 26	Bering Sea	101,000
Fanny Dutard	Sch.	252	Apr. 10	Aug. 14	do	189,000
Alice	Sch.	220	Apr. 5	Sept. 8	do	171,000
Joseph Russ	Sch.	235	Apr. 7	[a] Apr. 21		
Fortuna	Sch.	138	Apr. 11	Sept. 17	Bering Sea	89,000
John A	Sch.	235	Apr. 12	Sept. 15	North Pacific	134,000
Total		1,251				684,000
1913.						
CALIFORNIA.						
Galilee	Sch.	328	Mar. 7	Sept. 9	Bering Sea	145,000
Vega	Sch.	233	Feb. 6	Sept. 14	North Pacific	130,000
William H. Dimond	Sch.	376	Mar. 19	Aug. 20	Bering Sea	160,000
City of Papeete	Bkn.	370	Mar. 13	Aug. 27	do	183,000
Ottillie Fjord	Sch.	247	Mar. 18	Aug. 26	do	99,000
Total		1,554				717,000
WASHINGTON.						
Maid of Orleans	Sch.	171	Apr. 13	Sept. 10	Bering Sea	105,000
Fanny Dutard	Sch.	252	Apr. 11	do	do	195,000
Alice	Sch.	220	Mar. 27	Sept. 2	do	137,000
John A	Sch.	235	Apr. 5	Sept. 15	North Pacific	140,000
Chas. R. Wilson	Sch.	328	Apr. 2	Sept. 2	Bering Sea	187,000
Total		1,206				764,000
BRITISH COLUMBIA.						
Albert Meyer	Sch.	398	Aug. —	Oct. 16	Bering Sea	200
1914.						
CALIFORNIA.						
Sequoia	Sch.	324	Mar. 21	Sept. 9	Bering Sea	152,000
Galilee	Sch.	328	Mar. 24	Sept. 12	do	166,000
Vega	Sch.	233	Mar. 17	Aug. 26	North Pacific	150,000
City of Papeete	Bkn.	370	Mar. 23	Sept. 3	Bering Sea	187,000
Glendale	Sch.	281	do	Sept. 6	do	155,202
Ottillie Fjord	Sch.	247	Mar. 18	Sept. 3	do	121,000
Total		1,783				931,202
WASHINGTON.						
Azalea	Sch.	327	Apr. 6	Sept. 11	Bering Sea	212,000
Fanny Dutard	Sch.	252	Apr. 5	Sept. 15	do	172,000
Fortuna	Sch.	138	Apr. 2	Sept. 8	do	96,000
Alice	Sch.	220	Mar. 25	Sept. 15	do	171,000
Wawona	Sch.	413	Apr. 1	Sept. 11	do	240,000
John A	Sch.	235	Apr. 7	Sept. 13	do	100,000
Chas. R. Wilson	Sch.	328	Apr. 2	Sept. 7	North Pacific	209,000
Maid of Orleans	Sch.	171	Apr. 7	Sept. 13	Bering Sea	52,000
Total		2,084				1,252,000
BRITISH COLUMBIA.						
Albert Meyer	Sch.	398	Mar. 23	Sept. 9	Bering Sea	100,000
1915.						
CALIFORNIA.						
Sequoia	Sch.	324	Mar. 16	Aug. 13	Bering Sea	228,500
Galilee	Sch.	328	Mar. 24	Sept. 5	do	195,000
Vega	Sch.	233	Mar. 17	Aug. 26	North Pacific	119,000
Maweema	Sch.	392	Mar. 25	Sept. 7	Bering Sea	235,000
City of Papeete	Sch.	370	Mar. 23	Aug. 19	do	196,000
Glendale	Sch.	281	Mar. 20	Aug. 13	do	161,000
Ottillie Fjord	Sch.	247	Mar. 19	Aug. 27	do	120,000
Total		2,175				1,253,500

[a] Lost.

OPERATIONS OF THE COD FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Fishing grounds.	Number of fish taken.
1915.						
WASHINGTON.						
Azalea	Sch.	327	Apr. 12	Sept. 6	Bering Sea	206,000
Fanny Dutard	Sch.	252	Apr. 10	Sept. 4	do	188,000
Fortuna	Sch.	138	Mar. 23	Aug. 22	do	110,000
Alice	Sch.	220	Apr. 10	Sept. 6	do	167,248
Wawona	Sch.	413	Apr. 14	Aug. 21	do	258,323
John A	Sch.	235	Apr. 12	Sept. 30	North Pacific	154,000
Chas. R. Wilson	Sch.	328	Apr. 10	Sept. 4	Bering Sea	181,000
Maid of Orleans	Sch.	171	Apr. 3	do	do	110,000
Total		2,084				1,374,571
ALASKA.						
Highland Queen	Gas. s.	12	(a)		North Pacific	5,000
Challenge	Gas. s.	35			do	12,500
Silver Wave	Gas. s.	19			do	8,000
Miscellaneous power vessels	Gas. s.	101			do	80,000
Total		167				105,500

[a] Wrecked about Apr. 20.

SUMMARY OF THE SHORE-STATION DATA.

The following table shows, in a condensed form, the data relating to the vessels plying to and from the Alaska shore stations and the fish brought from thence to the home stations. These transporting vessels usually make several trips each year, and in some instances fishing vessels are utilized for this purpose when not engaged in fishing. The total fish transported represent the catches made at the various shore stations.

SUMMARY OF SHORE-STATION DATA.

Year.	Number of vessels.	Net tonnage.	Number of trips.	Number of cod brought to California.	Number of cod brought to Washington.	Total number from shore stations.
1876	1	114	1	30,000		30,000
1877	1	114	1	101,000		101,000
1878	3	190	6	227,000		227,000
1879	1	64	4	198,000		198,000
1880	2	172	4	201,000		201,000
1881	1	64	3	154,000		154,000
1882	1	108	3	203,000		203,000
1883	2	245	4	235,000		235,000
1884	1	137	3	249,000		249,000
1885	2	278	4	386,000		386,000
1886	3	454	5	383,000		383,000
1887	1	137	3	299,000		299,000
1888	2	285	4	372,000		372,000
1889	4	823	7	489,000		489,000
1890	4	621	9	773,000		773,000
1891	4	624	7	662,000		662,000
1892	2	388	4	700,000		700,000
1893	2	366	4	660,000		660,000
1894	1	218	2	305,000		305,000
1895	1	218	2	286,000		286,000
1896	1	125	1			No report.
1897	4	652	6	511,000		511,000
1898	6	930	9	450,000		450,000
1899	6	975	11	722,000		722,000

SUMMARY OF SHORE-STATION DATA—Continued.

Year.	Number of vessels.	Net tonnage.	Number of trips.	Number of cod brought to California.	Number of cod brought to Washington.	Total number from shore stations.
1900	5	896	9	909,000	....	909,000
1901	5	907	8	727,000	....	727,000
1902	6	1,080	11	1,140,000	....	1,140,000
1903	4	631	11	985,000	....	985,000
1904	6	1,100	10	999,000	43,000	1,042,000
1905	6	1,384	10	1,274,000	[a] 8,000	1,282,000
1906	11	2,117	15	890,632	130,000	1,020,632
1907	7	1,153	14	[b] 1,116,951	402,000	1,518,951
1908	9	2,281	12	994,403	152,000	1,146,403
1909	8	2,134	9	897,361	[c] 13,000	910,361
1910	3	724	7	680,600	[c] 2,875	683,475
1911	7	1,836	9	909,000	[d] 83,000	992,000
1912	4	1,040	7	960,984	[c] 36,950	997,934
1913	6	1,397	6	[e] 657,847	[c] 146,250	804,097
1914	6	1,465	11	1,481,000	[c] 104,600	1,585,600
1915	3	719	7	1,114,400	30,100	1,144,500
Total	....	....	....	24,293,178	1,151,775	25,444,953

[a] Schooner *Nellie Colman*, from Seattle, lost with 30 lives.
[b] Schooner *Glen*, from San Francisco, lost with 28,000 fish.
[c] Shipped on regular steamship lines.
[d] Eight thousand of these were shipped on regular steamers.
[e] Schooner *John D. Spreckles*, of San Francisco, lost with 145,000 cod aboard.

DETAILED OPERATIONS OF THE TRANSPORTING FLEET FROM 1876 TO 1915.

The table which follows shows in detail the cod shipped from the shore fishing stations in Alaska, from 1876, when the first station was established, to 1915, both inclusive. The name, rig, and tonnage of the transporting vessel is shown, together with the dates of departure from and arrival at the home station, also the number of cod brought.[a] From 1876 to 1903, both inclusive, the data relate exclusively to California.

OPERATIONS OF THE TRANSPORTING FLEET BY YEARS.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Number of fish brought.
1876.					
CALIFORNIA.[b]					
Wild Gazelle	Sch.	114	Oct. 18	....	30,000
1877.					
Wild Gazelle	Sch.	114	Sept. 24	Nov. 18	101,000
1878.					
Alaska	Sch.	32	Mar. 18	June 15	22,000
Do	....	....	June 24	Sept. 15	12,000
Alfred Adams	Sch.	64	Apr. 4	June 22	51,000
Do	....	....	July 9	Aug. 29	46,000
Do	....	....	Sept. 10	Nov. 9	51,000
Ariel	Sch.	94	....	June 25	45,000
Total	....	....	....	....	227,000

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[a] For the data relating to the fleet of transporters owned and operated from San Francisco the writer is indebted to the very complete and accurate records kept by the Union Fish Co. (formerly the McCollam Fishing & Trading Co.), of San Francisco.
[b] From 1876 to 1903, inclusive, the data relate to California exclusively.

OPERATIONS OF THE TRANSPORTING FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Number of fish brought.
1879.					
Alfred Adams	Sch.	64	Mar. 12	Apr. 25	56,000
Do			May 13	June 29	57,000
Do			July 11	Aug. 25	45,000
Do			Sept. 2	Oct. 14	40,000
Total					198,000
1880.					
Alfred Adams	Sch.	64	Mar. 16	May 8	42,000
Do			May 17	June 25	52,000
Do			July 3	Aug. 16	45,000
Wild Gazelle	Sch.	108	Sept. 11	Oct. 23	62,000
Total					201,000
1881.					
Alfred Adams	Sch.	64	Mar. 21	May 31	52,000
Do			June 7	July 19	51,000
Do			July 26	Sept. 18	51,000
Total					154,000
1882.					
Wild Gazelle	Sch.	108	Mar. 18	May 16	60,000
Do			June 2	July 28	83,000
Do			Aug. 12	Oct. 2	60,000
Total					203,000
1883.					
Wild Gazelle	Sch.	108	Mar. 20	June 14	85,000
Do			June 21	Aug. 3	90,000
Do			Aug. 15	(a)	
Czar	Sch.	137	Oct. 3	Nov. 10	60,000
Total					235,000
1884.					
Czar	Sch.	137	Mar. 23	June 14	102,000
Do			June 25	Aug. 14	97,000
Do			Sept. 16	Nov. 5	50,000
Total					249,000
1885.					
Czar	Sch.	137	Mar. 12	Apr. 20	60,000
Do			May 8	June 30	120,000
Do			July 19	Sept. 19	98,000
Dashing Wave	Sch.	141	Apr. 1	June 11	100,000
Total					378,000
1886.					
Arago	Sch.	176	Jan. 7	Sept. 18	60,000
Dashing Wave	Sch.	141	Mar. 14	May 30	58,000
Czar	Sch.	137	Apr. 1-4	May 24	99,000
Do			June 13	Aug. 10	101,000
Do			Aug. 28	Oct. 10	65,000
Total					383,000
1887.					
Czar	Sch.	137	Apr. 2	May 20	125,000
Do			June 11	Aug. 7	99,000
Do			Aug. 25	Oct. 15	75,000
Total					299,000

[a] Lost Aug. 19.

OPERATIONS OF THE TRANSPORTING FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Number of fish brought.
1888.					
Czar	Sch.	137	Mar. 12	May 14	131,000
Do			June 3	Aug. 8	115,000
Do			Aug. 26	Oct. 31	55,000
Eliza Miller	Sch.	148	Aug. 30	Oct. 25	71,000
Total					372,000
1889.					
Czar	Sch.	137	Feb. 11	Apr. 6	132,000
Do			May 2	June 25	127,000
Do			July 10	Sept. 1	66,000
Dashing Wave	Sch.	141	Mar. 21	June 28	95,000
Do			July 12	Oct. 8	
Arago	Sch.	176	Apr. 5	Aug. 21	65,000
Hera	Sch.	360			4,000
Total					489,000
1890.					
Czar	Sch.	137	Feb. 10	Apr. 7	115,000
Do			Apr. 19	June 17	117,000
Do			June 29	Aug. 30	103,000
Do			Sept. 13	Nov. 12	45,000
Dashing Wave	Sch.	141	Mar. 12	May 26	80,000
Do			June 15	July 26	80,000
Do				Oct. 22	70,000
John Hancock	Sch.	167	Mar. 16	Aug. 19	45,000
Arago	Sch.	176	Mar. 22	Aug. 12	118,000
Total					773,000
1891.					
John Hancock	Sch.	167	Jan. 7	May 31	85,000
Czar	Sch.	137	Feb. 12	Apr. 21	110,000
Do			May 5	July 3	122,000
Do			July 15	Sept. 1	130,000
Do			Sept. 13	Nov. 13	75,000
Blakeley	Bgn.	144	May 30	Aug. 21	90,000
Arago	Sch.	176	Sept. 10	Nov. 8	50,000
Total					662,000
1892.					
Czarina	Sch.	218	Jan. 30	Apr. 17	210,000
Do			May 14	July 11	240,000
Do			Aug. 18	Oct. 31	100,000
John F. Miller	Sch.	170	Apr. 30	June 28	150,000
Total					700,000
1893.					
Czarina	Sch.	218	Feb. 3	Apr. 28	240,000
Do			May 18	July 18	215,000
Do			Aug. 19	Oct. 27	75,000
Eliza Miller	Sch.	148	May 14		130,000
Total					660,000
1894.					
Czarina	Sch.	218	Apr. 5	June 28	190,000
Do			Aug. 4	Oct. 10	115,000
Total					305,000
1895.					
Czarina	Sch.	218	Mar. 7	May 18	126,000
Do			Aug. 4	Oct. 18	160,000
Total					286,000

OPERATIONS OF THE TRANSPORTING FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Number of fish brought.
1896.					
Francis Alice	Sch.	125	Aug. 28		(a)
1897.					
Eliza Miller	Sch.	148	Jan. 4	Feb. 17	77,000
Czarina	Sch.	218	Sept. 12[b]	Apr. 26	118,000
Mary and Ida	Sch.	174	May 7	Sept. 9	90,000
Winchester	Sch.	112	May 26	Sept. 3	47,000
Czarina	Sch.	218	June 23	Sept. 8	144,000
Mary and Ida	Sch.	174	Feb. 4	Apr. 27	35,000
Total					511,000
1898.					
Czarina	Sch.	218	Sept. 30[c]	Mar. 7	17,000
Winchester	Sch.	112	Sept. 20[c]	Mar. 10	101,000
Do			Mar. 24	June 17	30,000
Czarina	Sch.	218	Apr. 7	Sept. 7	118,000
Arago	Sch.	176	Oct. 3[c]	Apr. 10	26,000
Francis Alice	Sch.	125		June 11	52,000
Mary and Ida	Sch.	174	Aug. —	Sept. 27	47,000
Francis Alice	Sch.	125	Sept. 29	Dec. 16	28,000
Winchester	Sch.	112	June 26	Oct. 31	31,000
Total					450,000
1899.					
Winchester	Sch.	112	Jan. 3	Mar. 9	40,000
Arago	Sch.	176	Aug. 2[d]	Jan. 20	25,000
Francis Alice	Sch.	125	Dec. 29[d]	Feb. 25	61,000
Do			Mar. 11	June 5	78,000
Winchester	Sch.	112	Mar. 17	May 19	63,000
Czarina	Sch.	218	Sept. 28[d]	Apr. 3	71,000
John F. Miller	Sch.	170	May 5	July 5	79,000
Winchester	Sch.	112	June 4	Aug. 1	36,000
Mary and Ida	Sch.	174	Oct. 30[d]	July 28	75,000
Do			Aug. 25	Dec. 12	129,000
Francis Alice	Sch.	125	Oct. 21	Dec. 20	65,000
Total					722,000
1900.					
Anna	Sch.	227	Jan. 6	Mar. 27	90,000
Czarina	Sch.	218	Jan. 17	Mar. 23	170,000
Mary and Ida	Sch.	174	Mar. 19	Aug. 2	106,000
Arago	Sch.	176	Oct. 12[e]	Mar. 27	35,000
Czarina	Sch.	218	Apr. 11	June 28	192,000
Winchester	Sch.	112	Oct. 1[e]	May 10	55,000
Do			May 23	Aug. 8	57,000
Czarina	Sch.	218	July 22	Oct. 20	123,000
Mary and Ida	Sch.	174	Aug. 21	Nov. 14	81,000
Total					909,000
1901.					
Arago	Sch.	176	Oct. 9[f]	Mar. 21	31,000
Mary and Ida	Sch.	174	Mar. 24	Aug. 27	95,000
Winchester	Sch.	112	Apr. 7	June 26	85,000
Czarina	Sch.	218	Nov. 3[f]	Apr. 15	165,000
Anna	Sch.	227	Nov. 21[f]	(g)	
Czarina	Sch.	218	May 6	July 13	206,000
Winchester	Sch.	112	July 13	Sept. 15	85,000
Do			Oct. 8	Nov. 23	60,000
Total					727,000

[a] Catch not reported.

[b] 1896.

[c] 1897.

[d] 1898.

[e] 1899.

[f] 1900.

[g] Lost Company Harbor, Sannak Island, Mar. 3, 1901.

OPERATIONS OF THE TRANSPORTING FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Number of fish brought.
1902.					
Mary and Ida	Sch.	174	Sept. 29[a]	Jan. 14	16,000
Pearl	Sch.	120	Feb. 2	May 15	60,000
Czarina	Sch.	218	Oct. 6[a]	Feb. 16	167,000
Arago	Sch.	176	Oct. 26[a]	Mar. 10	45,000
Czarina	Sch.	218	Mar. 16	May 29	208,000
Mary and Ida	Sch.	174	Feb. 5	Mar. 20	125,000
Pearl	Sch.	120	May 24	July 9	60,000
Czarina	Sch.	218	June 20	Aug. 25	208,000
Stanley	Sch.	253	Sept. 14	Nov. 11	112,000
Mary and Ida	Sch.	174	Sept. 16	Nov. 28	48,000
Viking	Sch.	139	....	Aug. 1	91,000
Total	......	......	......	......	1,140,000
1903.					
Pearl	Sch.	120	Dec. 7[b]	Jan. 28	18,000
Czarina	Sch.	218	Jan. 28	Mar. 30	135,000
Pearl	Sch.	120	Feb. 12	Mar. 26	22,000
Volante	Sch.	119	Mar. 10	June 6	150,000
Pearl	Sch.	120	Apr. 9	May 28	68,000
Czarina	Sch.	218	Apr. 12	July 18	192,000
Pearl	Sch.	120	June 5	July 26	66,000
Do	......	......	Aug. 11	Oct. 6	54,000
Czarina	Sch.	218	...do....	Nov. 9	180,000
Pearl	Sch.	120	Oct. 26	Dec. 28	30,000
Mary and Ida	Sch.	174	Sept. 30	Dec. 24	70,000
Total	......	......	......	......	985,000
1904.					
CALIFORNIA.					
Czarina	Sch.	218	Jan. 17	Mar. 24	144,000
Mary and Ida	Sch.	174	...do....	(c)	....
Pearl	Sch.	120	Jan. 19	Mar. 24	55,000
John D. Spreckles	Sch.	268	Apr. 10	June 22	140,000
Pearl	Sch.	120	...do....	Aug. 10	38,000
Czarina	Sch.	218	Apr. 11	June 20	204,000
Do	......	......	July 22	Oct. 3	180,000
Pearl	Sch.	120	Sept. 27	Nov. 18	30,000
John D. Spreckles	Sch.	268	Aug. 11	Nov. 26	168,000
Total	......	......	......	......	959,000
WASHINGTON.					
Carrier Dove	Sch.	82	....	Feb. 20	43,000
1905.					
CALIFORNIA.					
Czarina	Sch.	218	Jan. 16	Mar. 19	125,000
Do	......	......	Apr. 1	July 18	163,000
Do	......	......	Aug. 17	Nov. 5	144,000
Annie Larsen	Sch.	326	Apr. 5	June 10	252,000
Stanley	Sch.	253	Oct. 23[d]	Jan. 20	205,000
Do	......	......	Oct. 10	......	....
John D. Spreckles	Sch.	268	Oct. 24	Dec. 1	....
W. H. Dimond	Sch.	376	Jan. 18	Mar. 22	150,000
Zampa	Sch.	322	Oct. 12	......	....
Marion	Sch.	228	Apr. 1	June 18	145,000
Do	......	......	July 18	Sept. 24	90,000
John F. Miller	Sch.	170	Oct. 7	......	....
Glen	Sch.	121	Sept. 19	......	....
Total	......	......	......	......	1,274,000
WASHINGTON.					
From Kodiak	......	......	July 10	Oct. 12	8,000
Nellie Colman	Sch.	122	Oct. 1	(e)	....

[a] 1901.

[b] 1902.

[c] Lost on Unga Island, Feb. 28, 1904; had 78,000 fish aboard.

[d] 1904.

[e] Wrecked.

OPERATIONS OF THE TRANSPORTING FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Number of fish brought.
1906.					
CALIFORNIA.					
Marion	Sch.	228	([a])	Mar. 12	20,000
Do			Mar. 19	([b])	
Czarina	Sch.	218	Feb. 26	July 19	153,349
Do			Aug. 13	Oct. 29	98,000
Stanley	Sch.	253	Oct. 10[c]	Mar. 10	68,000
Alpha	Sch.	274	Mar. 12	June 19	244,253
John F. Miller	Sch.	170	Oct. 7[c]	Mar. 17	25,000
Do			Apr. 8	July 5	84,000
Do			July 29	Sept. 30	40,000
Glen	Sch.	121	Sept. 19[c]	Mar. 8	5,000
Dora Bluhm	Sch.	315	May 2	Sept. 11	33,000
Newport	S. S.	149	July 4	Aug. 19	125,000
Total					890,682
WASHINGTON.					
Maid of Orleans	Sch.	171		March	10,000
Ralph J. Long	Sch.	85	June 23	July 5	100,000
Fortuna	Sch.	138	([a])	Apr. 5	20,000
Total					130,000
1907.					
CALIFORNIA.					
W. H. Dimond	Sch.	376	Dec. —[d]	Jan. 18	103,000
Do			Mar. 20	June 4	262,000
Do			June 21	Oct. 2	60,000
Do			Oct. 31		
Hunter	Sch.	60	Sept. 20[d]	Sept. 30	80,000
Czarina	Sch.	218	Jan. 24	Mar. 27	130,000
Do			Apr. 20	July 19	177,665
Do			Aug. 22	Nov. 9	174,286
Rosie H	Sch.	60	([a])	June 27	45,000
Glen	Sch.	121	Apr. 13	June 10	85,000
Do			Aug. 26	([e])	
Total					1,116,951
WASHINGTON.					
Maid of Orleans	Sch.	171	Apr. 2	July 30	98,000
Do			Aug. 29		169,000
Fortuna	Sch.	138	Mar. 15	May 15	40,000
Do			May 27	Oct. 1	95,000
Total					402,000
1908.					
CALIFORNIA.					
W. H. Dimond	Sch.	376	Jan. 28	Mar. 22	90,000
John D. Spreckles	Sch.	253	Mar. 13	June 20	205,000
Do			July 23	Oct. 19	30,000
Repeat	Sch.	410	Apr. 18	July 9	In ballast
City of Papeete	Bkn.	370	Oct. 9		
Czarina	Sch.	218	Dec. 12[f]	Mar. 7	92,959
Do			Apr. 2	July 11	186,560
Ivy	Sch.	135	Mar. 19	May 15	100,000
Ida McKay	Sch.	178	Apr. 6	June 18	150,000
Do			July 11	Sept. 22	106,000
John F. Miller	Sch.	170	Nov. 23[f]	([g])	
Total					994,408
WASHINGTON.					
Maid of Orleans	Sch.	171		Mar. 8	65,000
Do			Sept. 24	Nov. 22	87,000
Total					152,000

[a] Wintered in the North.
[b] Lost Apr. 11, 1906.
[c] 1905.
[d] 1906.
[e] Lost Sept. 30, with 28,000 fish.
[f] 1907.
[g] Wrecked Jan. 8, 1908.

Operations of the Transporting Fleet by Years—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Number of fish brought.
1909.					
CALIFORNIA.					
City of Papeete	Bkn.	370	Sept. 3	Oct. 29	155,000
John D. Spreckles	Sch.	253	Dec. 5[a]	Feb. 21	44,000
W. H. Dimond	Sch.	376	Mar. 15	May 12	105,000
Czarina	Sch.	218	Oct. 9[a]	Feb. 25	125,000
Stanley	Sch.	253	Apr. 26	June 25	272,361
Ida McKay	Sch.	178	Mar. 30	June 14	65,000
Dora Bluhm	Sch.	315		July 8	85,000
Do				Sept. 26	16,000
San Buena Ventura	Sch.	171		Nov. —	30,000
Total					897,361
WASHINGTON.					
Regular steamers			(b)	(b)	13,000
1910.					
CALIFORNIA.					
John D. Spreckles	Sch.	253	Nov. 10[c]	Mar. 9	90,000
Do			Mar. 25	May 31	90,000
Do			June 13	Oct. 8	130,000
Stanley	Sch.	253	Oct. 17[c]	(d)	
Czarina	Sch.	218	June 13	Aug. 16	120,600
Do			Apr. 7	May 31	160,000
Do			Oct. 7	Nov. 24	90,000
Total					680,600
WASHINGTON.					
Regular steamers			(b)	(b)	2,875
1911.					
CALIFORNIA.					
John D. Spreckles	Sch.	253	Oct. 31[e]	Mar. 17	131,000
Do			Apr. 9	June 20	169,000
Do			July 16	Sept. 25	103,000
City of Papeete	Bkn.	370	Oct. 4	Dec. 7	55,000
Galilee	Sch.	328	May 20	July 27	251,000
Czarina	Sch.	218	Jan. 15	(f)	
Sequoia	Sch.	324	Aug. 14	Oct. 10	200,000
Ottillie Fjord	Sch.	247	Sept. 25	Dec. 8	
Total					909,000
WASHINGTON.					
Bender Bros	Sch.	96	Apr. 20	June 6	75,000
Regular steamers			(b)	(b)	8,000
Total					83,000
1912.					
CALIFORNIA.					
Vega	Sch.	233	Oct. 20[g]	Jan. 17	152,000
Sequoia	Sch.	324	Mar. 31	July 1	276,984
John D. Spreckles	Sch.	253	Apr. 7	Apr. 27	150,000
Bertha Dolbeer	Sch.	230	Apr. 6	June 27	30,000
John D. Spreckles	Sch.	253	May 29	Aug. 29	135,000
Sequoia	Sch.	324	July 27	Oct. 6	210,000
Bertha Dolbeer	Sch.	230		Nov. 17	7,000
Total					960,984
WASHINGTON.					
Regular steamers			(b)	(b)	36,950

[a] 1908.
[b] Various dates.
[c] 1909.
[d] Wrecked Mar. 28, 1910.
[e] 1910.
[f] Lost Feb. 15, 1910.
[g] 1911.

OPERATIONS OF THE TRANSPORTING FLEET BY YEARS—Continued.

Name of vessel.	Rig.	Net tonnage.	Date of sailing.	Date of return.	Number of fish brought.
1913.					
CALIFORNIA.					
Galilee	Sch.	328	Nov. 11[a]	Jan. 11	190,847
Sequoia	Sch.	324	Mar. 29	May 30	240,000
Golden State	Sch.	223	Aug. 15	Oct 13	175,000
John D. Spreckles	Sch.	253	Jan. 25	(b)	
Bertha Dolbeer	Sch.	230	Mar. 8	July 28	52,000
Total					657,847
WASHINGTON.					
Union Jack	Sch.	39		Oct. 29	20,000
Regular steamers			(c)	(c)	126,250
Total					146,250
1914.					
CALIFORNIA.[d]					
City of Papeete	Bktn.	370	Oct. 8[d]	Jan. 26	200,000
Do			Oct 18	Dec. 21	45,000
Golden State	Sch.	223	Nov. 15[d]	Jan. 15	159,000
Do			Mar. 5	Apr. 20	199,420
Do			May 20	Aug. 4	194,000
Do			Oct. 15	Dec. 20	171,000
W. H. Dimond	Sch.	376	Jan. 9	Jan. 28[e]	
Allen A.	Sch.	266	Mar. 3	May 27	240,000
Do			June 20	Nov. 2	200,000
Bertha Dolbeer	Sch.	230	Mar. 10	May 27	32,000
Do			July 18	Oct 1	41,000
Total					1,481,420
WASHINGTON.					
Independent stations, regular steamers			(c)	(c)	104,600
1915.					
CALIFORNIA.					
Golden State	Gas. s.	223	Feb. 21	Apr. 12	174,000
Do			May 6	July 1	230,000
Do			Oct. 19	Dec. 15	170,000
Allen A.	Sch.	266	Feb. 18	June 2	267,400
Do			June 18	Aug. 15	193,000
Do			Sept. 6	Dec. 22	47,000
Bertha Dolbeer	Sch.	230	Mar. 13	June 2	33,000
Total					1,114,400
WASHINGTON.					
Regular steamers			(c)	(c)	30,100

[a] 1912.
[b] Lost; had 145,000 fish aboard; all lost.
[c] Various dates.
[d] 1913.
[e] Lost.

DISASTERS TO THE FLEET.

Operating as it does in far northern waters, where the dangers to navigation are numerous and the waters are very poorly surveyed and charted, it is a matter for congratulation that so few disasters have been recorded as occurring to the fleet. The following table, which is not claimed to be complete, shows the total wrecks of which it was possible to find a record. No account is taken of the many minor accidents to the fleet, of partial disablements, groundings, etc., some of which proved very costly to the owners, however.

RECORD OF WRECKS OF CODFISH VESSELS FROM 1877 TO 1915, INCLUSIVE.

Name.[a]	Owner and home port.	Where wrecked.	Date.	Lives lost.	Codfish lost.
Brontes	——, San Francisco		1877		
Sarah	Lynde & Hough, San Francisco.		1879		
Nagay[b]	McCollam & Co., Alaska	Popof Island	Summer, 1880		
General Miller	N. Bichard, San Francisco		1882		
H. L. Tiernan	Lynde & Hough, San Francisco.	Shumagin Islands.	1882		
Wild Gazelle	McCollam & Co., San Francisco.		Aug. 19, 1883		
Isabel	Hansen & Anderson, San Francisco.	Foundered at sea	1888	14	
Dashing Wave	Lynde & Hough, San Francisco.	Bering Sea	Apr. 16, 1891		
John Hancock	do		Mar. 7, 1898		
Anna	Alaska Codfish Co., San Francisco.	Bering Sea	1902		
Mary and Ida	do	Unga Island	Feb. 28, 1904		78,000
Pearl	do		1905	30	
Nellie Colman	Seattle & Alaska Codfish Co., Seattle.	At sea	1905	30	
Pirate[b]	Union Fish Co., Alaska	Alaska	1906		
Marion	Alaska Codfish Co., San Francisco.	Sannak Island	Apr. 11, 1906		
Glen	Pacific States Trading Co., San Francisco.	Unimak Island	Sept. 30, 1907	1	28,000
John F. Miller	do	do	Jan. 8, 1908	[c]10	
Stanley	Union Fish Co., San Francisco.	Sannak Island	Mar. 28, 1910	4	
Czarina	do	Nagai Island	Feb. 15, 1911		
Joseph Russ	Robinson Fisheries Co., Anacortes, Wash.	Chirikof Island	Apr. 21, 1912	1	
John D. Spreckles	Alaska Codfish Co., San Francisco.	Run down off California coast.	Mar. 20, 1913	2	145,000
W. H. Dimond	do	Bird Island	Feb. 8, 1914		
Nonpareil[b]	do	Shumagin Islands.	1915		
Highland Queen		Shumagin Islands.	About Apr. 20		

[a] All schooner rigged, except the *Nonpareil*, which was a power schooner.
[b] Employed in station work.
[c] All frozen to death.

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EXPLORATIONS OF THE UNITED STATES COAST AND GEODETIC SURVEY STEAMER "BACHE" IN THE WESTERN ATLANTIC, JANUARY-MARCH, 1914, UNDER THE DIRECTION OF THE UNITED STATES BUREAU OF FISHERIES.—OCEANOGRAPHY

By Henry B. Bigelow

Appendix V to the Report of the United States Commissioner
of Fisheries for 1915

CONTENTS.

Page.
Introduction.. 5
The Atlantic water.. 6
Temperature and salinity profiles..................................... 14
The Straits of Florida.. 26
The coast water off Chesapeake Bay.................................... 45
Tables.. 55
Bibliography.. 60

EXPLORATIONS OF THE UNITED STATES COAST AND GEODETIC SURVEY STEAMER "BACHE" IN THE WESTERN ATLANTIC, JANUARY-MARCH, 1914, UNDER THE DIRECTION OF THE UNITED STATES BUREAU OF FISHERIES.—OCEANOGRAPHY.

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INTRODUCTION.

In connection with the oceanographic and fishery investigations between the Grand Banks and Cape Hatteras which have been prosecuted by the Bureau of Fisheries for a number of years (Bigelow, 1914a–1915), there developed an appreciation of the importance of studying the conditions between the southern Atlantic coast and the Bermudas, Bahamas, and Cuba. As the Bureau of Fisheries had no vessel on the Atlantic coast which was suitable for this offshore work, a request for assistance and cooperation was preferred to the Coast and Geodetic Survey, which also was interested in certain phases of the investigation, particularly the physical hydrography.

The Superintendent of the Survey promptly acquiesced in the suggestion and under an arrangement for an equitable division of expenses, the Coast and Geodetic Survey steamer *Bache*, under the command of Capt. C. C. Yates, was assigned to the duty. The investigations were under the direction of the Bureau of Fisheries, W. W. Welsh, assistant in that Bureau, having immediate charge. The cruise lasted from January 20, 1914, to March 23 of the same year.

The course of the *Bache* (see chart) led from Chesapeake Bay to the oceanic basin in longitude 73° 15′, thence south to latitude 32° 30′, and from that point to Bermuda. Sailing from Bermuda on February 17, she ran 200 miles southwest, to latitude 29° 30′, then west to a point 140 miles north of the Bahamas, and south to Nassau. Three sections were then run across the Straits of Florida, viz, Key West to Habana, Founey Rocks (Cape Florida) to Gun Cay, and Jupiter Inlet to the northern end of the Little Bahama Bank (Mar. 13–21); and, finally, a line thence to connect with the Bermuda-Bahama line. Serial oceanographic observations were taken at 38 stations and surface temperatures and water samples at 19 additional stations. The temperatures[a] were taken with reversing thermometers of the latest type, with auxiliary thermometers to give the temperature of the detached thread of mercury at the moment of reading. The water samples were collected with Ekman reversing water bottles (Ekman, 1905b) and with the Bigelow stopcock water bottle (Bigelow, 1914a). Unfortunately, the former proved unreliable in the strong currents in which much of the work was carried on; consequently a number of the water samples are untrustworthy, and such have been omitted from the table of salinity (p. 55).

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[a] Temperatures are centigrade.

The limitation of the gear on the *Bache* made it impracticable to work deeper than 1,800 meters. Only occasionally were water samples or temperatures taken on the sounding wire at greater depths; but down to 1,800 meters the records are sufficiently full to afford a satisfactory survey of both temperature and salinity.

Throughout the cruise the weather was most unfavorable. There was a constant succession of gales, occasionally of almost hurricane strength, taxing vessel and personnel to the utmost.

The salinities were executed in the laboratories of the United States Bureau of Fisheries at Washington.

THE ATLANTIC WATER.

The *Bache* stations give a survey of the upper 1,800 fathoms between Chesapeake Bay and Bermuda; from Bermuda to a point 200 miles to the southwest; and between the latter and the northern end of the Bahama Bank. (See chart.) Off Chesapeake Bay the surface temperature (fig. 1) rose suddenly from about 12° over the 200-meter contour to 21.5° 80 miles farther east. This very warm water was evidently only a very narrow band, for as a rule the surface water, as far as Bermuda, was 18.8°–19.5°. Close to Bermuda the surface temperature was 18°–19°; but about 200 miles farther south it rose to 21°, and on the line to the Bahamas it was constantly 20° or warmer, except between longitude 67° 30′ and 71°, where cooler water was encountered. North of the Bahamas the surface water warmed to 23°; and it was even warmer, 23.6°, at the mouth of the Straits of Florida, off Jupiter Inlet. These observations show that there were four fairly distinct temperature zones, as outlined on the chart (fig. 1): First, the coast water off Chesapeake Bay, 15° or colder, which probably extends, though with constantly rising temperature, to Savannah; second, the general warm water of the Antilles drift, with temperatures warmer than 20°, which swings northeastward parallel to the coast, reaching latitude about 36° in January and February; third, the superheated water coming from the Gulf of Mexico, via the Straits of Florida, which gradually merges with the Atlantic water; and, fourth, a comparatively cool region west of Bermuda, no doubt continuous with the colder water farther north. All this, of course, agrees in its main lines with the earlier temperature charts (Agassiz, 1888; Berghaus, 1891; Deutsche Seewahrte, 1882) and the correspondence with Schott's (1912) chart for the month of February is extremely close. Thus there is no reason to suppose that the surface temperatures in the winter of 1913–14 were anything but normal.

In the eastern half of the region surface salinity (fig. 2) agreed very well with surface temperature, being lower than $36.5^{\circ}/_{00}$ to the west and southwest of Bermuda; with the curve for $36.5^{\circ}/_{00}$ nearly paralleling the curve of 20° temperature here, and the curve of $36.6^{\circ}/_{00}$ that for 21°. Water salter than $36.5^{\circ}/_{00}$ formed a very well-defined tongue swinging northeastward from the Bahama Bank, the curve for $36.4^{\circ}/_{00}$ paralleling the coast line, with water fresher than $35^{\circ}/_{00}$ next the land off Cape Hatteras, and probably as far south as northern Florida. The $36.5^{\circ}/_{00}$ water may be definitely classed as the continuation of the Antilles current, thus agreeing with the temperature curves; the slightly fresher water (36–$36.4^{\circ}/_{00}$) west of it as largely Florida current water; and the still fresher water next the coast north of Florida as coast water.

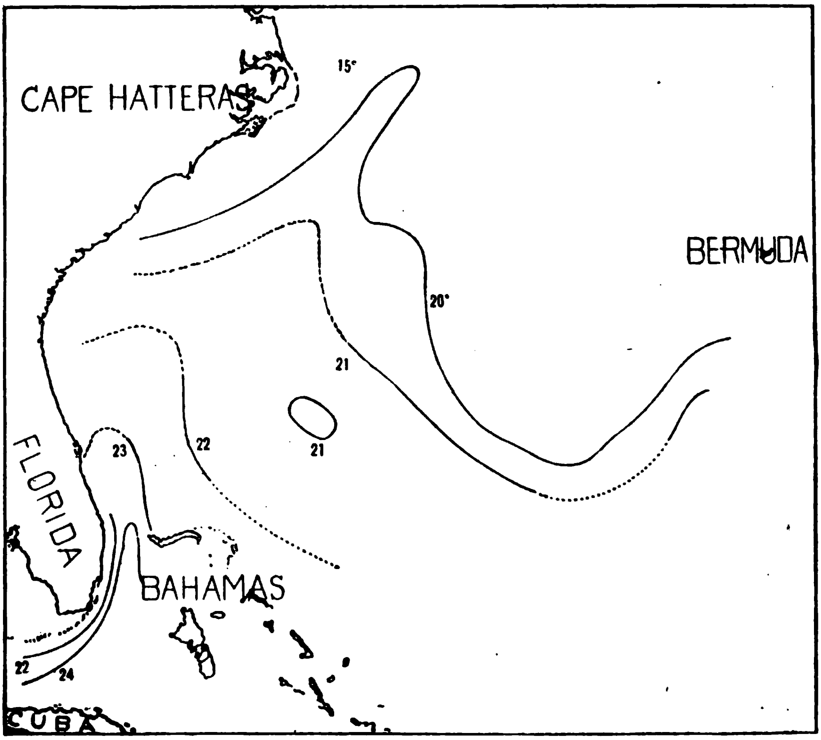

FIG. 1.—Surface temperature of the western Atlantic, coast of United States to Bermuda, January to March, 1914.

Schott's (1902) chart of average surface salinity for the year shows the same northward tongue of 36.5°/₀₀ or Antilles water, as is to be seen on the *Bache* chart (fig. 2); but most of the critical area is blank for want of data. The records since collected by the international committee for the exploration of the sea (1909, 1910, 1911) add very little to our knowledge of the region in question, those for this general part of the Atlantic being chiefly limited to a line from the neighborhood of Bermuda to Jamaica. In short, previous salinity records, at least by modern methods, are so scanty for the region crossed by the *Bache* that it is impossible to state whether the conditions which she encountered there are characteristic of the winter season.

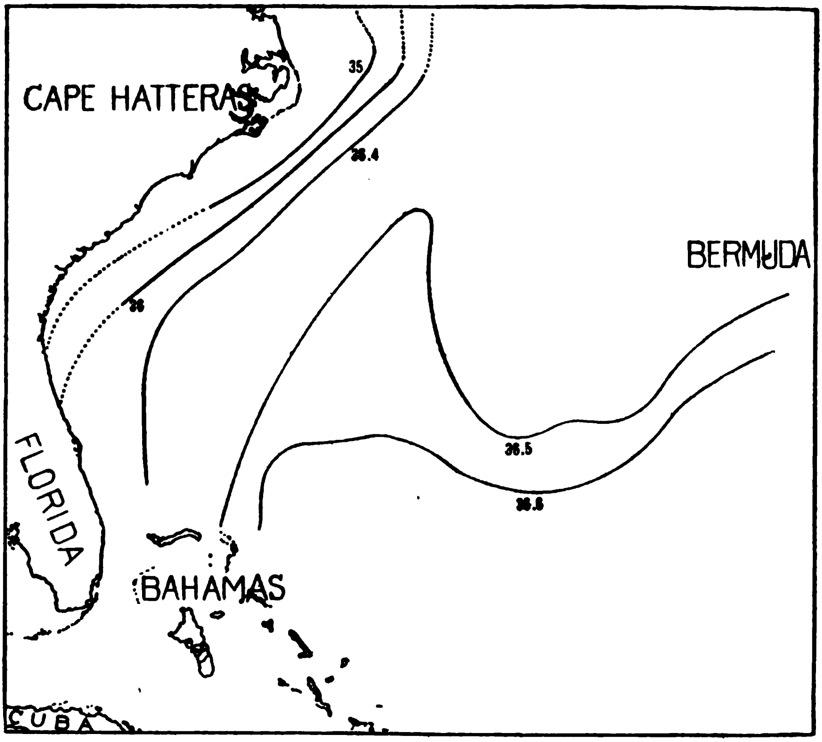

FIG. 2.—Surface salinity of the western Atlantic, coast of United States to Bermuda, January to March, 1914.

Typical examples of the serial temperatures and salinities taken by the *Bache* between the continental slope and Bermuda, and between Bermuda and the Bahama Bank, which are given in full in the tables (p. 55), are represented graphically in the accompanying sections (fig. 3–10). The temperatures all agree in showing a general cooling from 19°–22° on the surface to about 4° at 1,800 meters. The curves southwest of Bermuda are all approximately parallel, though with slight variations in the middepths, and especially near the surface. Between Bermuda and the Chesapeake (fig. 3) there are great variations in temperature station to station, between 700 and 1,400 meters, though the temperature was comparatively uniform at 1,800 meters and between 700 meters and the surface. This was also the case, though to less degree, north and northeast of the Bahamas (fig. 6). On the whole the middepths were warmest

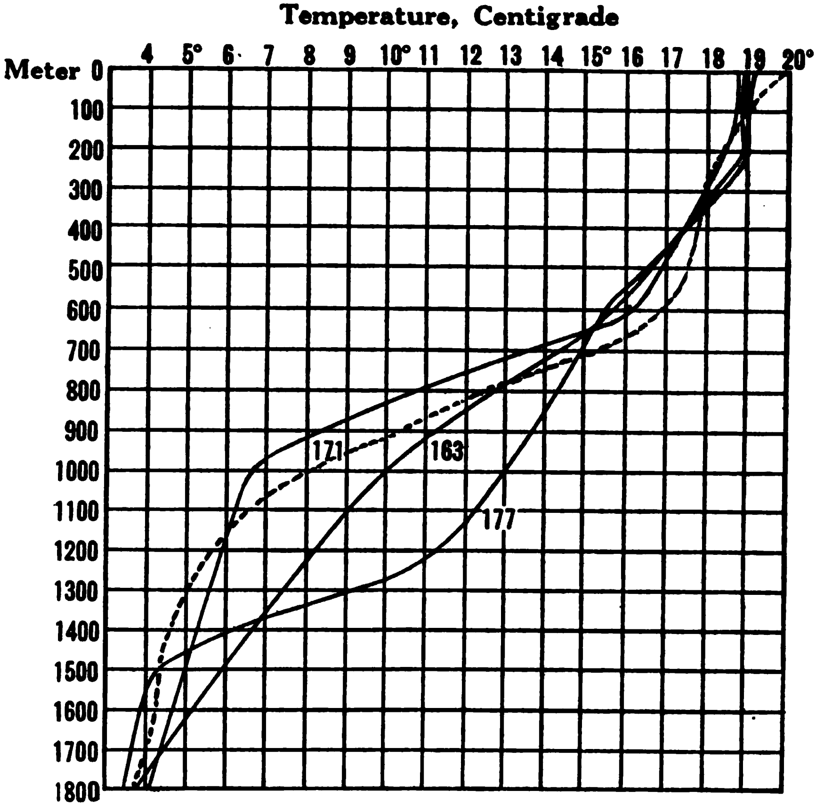

FIG. 3.—Temperature sections between the continental slope off Chesapeake Bay and Bermuda, stations 10163, 10171, 10177; and *Challenger* station 37, 40 miles west of Bermuda, April 24, 1878 (......).

west of Bermuda (station 10177), coldest north of the Bahamas (stations 10210–10212) and in the northeast Providence Channel (station 10196), if we omit for the moment the very much colder water over the continental slope. In the upper layers, between, say, 300 meters and the surface, the Antilles water was warmest, this relationship of the various stations to one another being more clearly revealed by the profiles (fig. 11, 12, 15) and charts of temperature at different levels (fig. 17, 18, 20).

The course of the *Challenger* in 1873 crossed that of the *Bache* at Bermuda, allowing a direct comparison of the vertical distribution of temperatures for 1873 (Murray, 1884) and 1914 in that neighborhood. The temperature series taken by the *Challenger* about 260 miles south of Bermuda in March of that year (*Challenger* station 29), agrees very closely with the serial at *Bache* station 10185, except near the surface, as shown by the following table:

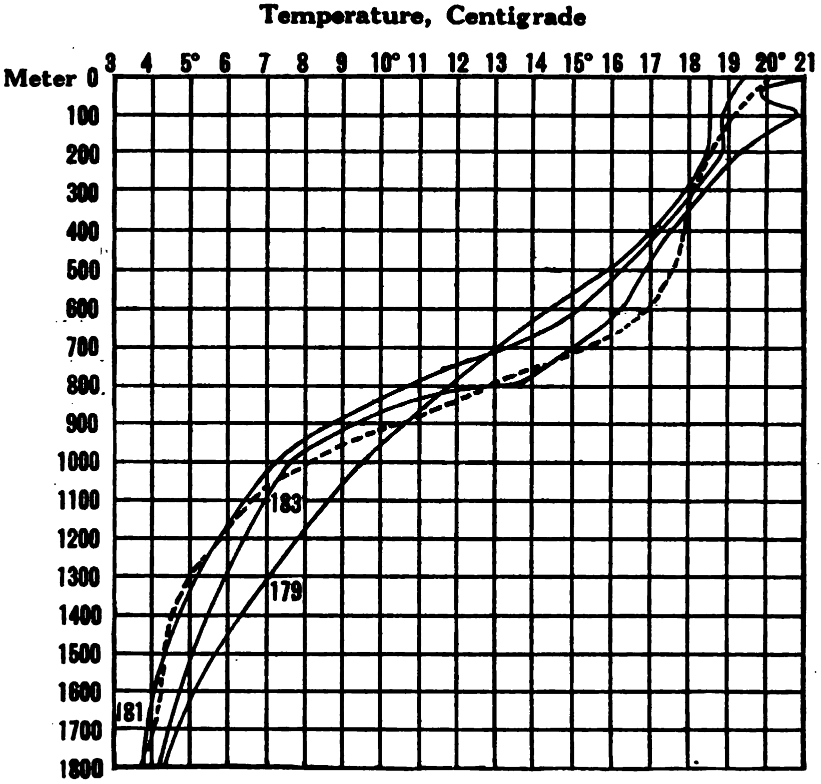

FIG. 4.—Temperature sections on a line running 200 miles southwest from Bermuda; stations 10179, 10181, 10183; and *Challenger* station 37 (......).

Depth in meters.	Bache station 10185.	Bache station 10212.	Challenger station 29.	Depth in meters.	Bache station 10185.	Bache station 10212.	Challenger station 29.
	° C.	° C.	° C.		° C.	° C.	° C.
0	19.8	20.75	22.2	1,000	7.1	5.62	5.8
100	19.55	20.5	20.3	1,100	6.2	5	4.7
200	18.6	19.2	18.2	1,200	5.4	4.6	4.6
300	17.3	17.77	17.5	1,300	4.8	4.4	4.5
400	16.4	16	16.7	1,400	4.44	4.2	4.5
500	15.5	14.62	15.5	1,500	4.1	4	4.2
600	14.4	12.8	13.8	1,600	3.9	3.8	4
700	11.7	10.8	11.5	1,700	3.8	3.7	3.9
800	9.67	9	9	1,800	3.77	3.67	3.9
900	8.2	7	7.3				

Between 200 and 800 meters, and again below 1,200 meters, the greatest difference is only 0.6°, hardly more than the probable error of the curves from which the table is constructed. Above 200 meters the *Challenger* series is decidedly the warmer; but this difference is probably due to the geographic location of the stations, the temperature of 1914 (fig. 1) suggesting that in that year also the surface reading would have been above 21° at the locality of the *Challenger* station. Between the 800 and the 1,200 meter levels the temperatures were from 0.6° to 1.5° lower in 1873 than in 1914; but here again it may be the difference in geographic location which is responsible, the lower temperature of the *Challenger* station at this depth being an indication of the general and well-known upwelling of abyssal water toward the Equator. Indirect evidence to this effect is afforded by the fact that these *Challenger* temperatures agree almost exactly, below 800 meters, with *Bache* station 10212 on nearly the same latitude north of the Bahama Bank, and they do not differ from the latter by more than 1.4° at any depth, as illustrated in the preceding table (p. 10).

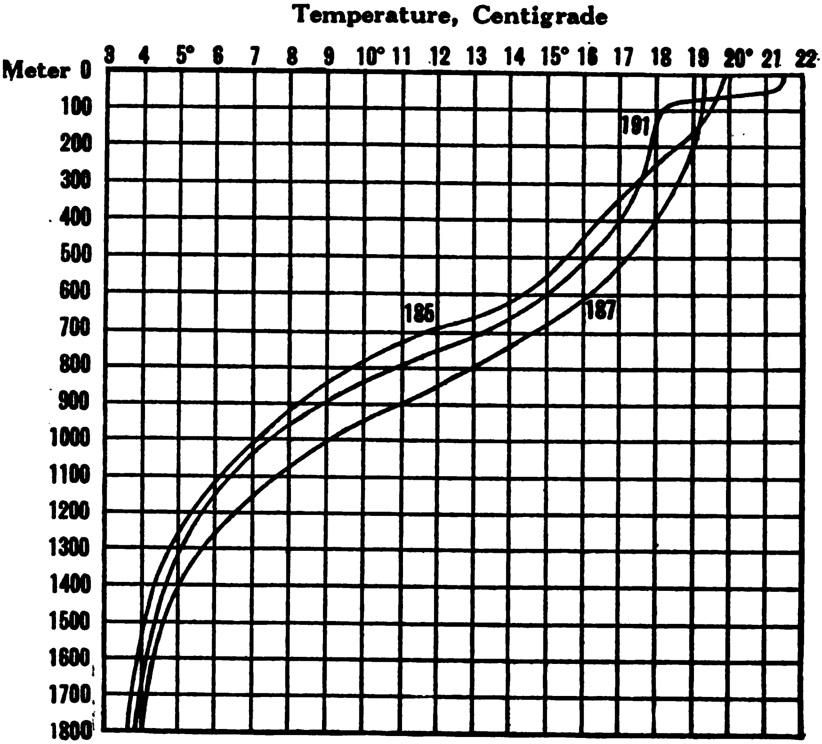

FIG. 5.—Temperature sections between Bermuda and the Bahama bank; stations 10185, 10187, 10191.

The temperatures a few miles south of Bermuda agree very closely for the two years, one being slightly colder at some depths, the other at other depths, as illustrated by the following table, constructed from the temperature curves for *Challenger* station 57b, 20 miles southwest of Bermuda (Murray, 1884), and *Bache* station 10181:

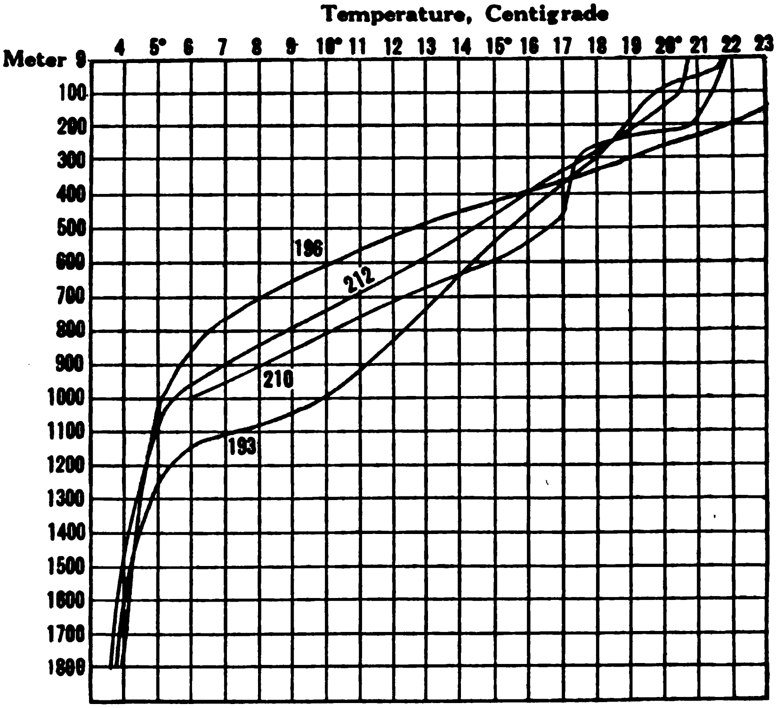

Fig. 6.—Temperature sections in the oceanic basin east of the Bahama Bank; stations 10193, 10210, 10212; and in the northeast Providence channel, station 10196. (Down to 1,800 meters only.)

Depth in meters.	Bache station 10181.	Challenger station 57*b*.	Difference.	Depth in meters.	Bache station 10181.	Challenger station 57b.	Difference.
	° *C.*	° *C.*	° *C.*		° *C.*	° *C.*	° *C.*
0	19.37	22.78	+3.41	1,000	7.38	6.5	− .88
100	18.78	19.7	+ .92	1,100	6.5	5.3	−1.2
200	18.89	18.5	− .39	1,200	5.7	4.7	−1
300	18.2	17.8	− .6	1,300	5.2	4.4	− .8
400	17.13	17.2	− .07	1,400	4.88	4.2	− .68
500	16.3	16.6	+ .3	1,500	4.4	3.9	− .5
600	15.2	15.4	+ .2	1,600	4	3.8	− .2
700	13.2	13.5	+ .3	1,700	3.9	3.7	− .2
800	10.7	11.2	+ .5	1,800	3.89	3.5	− .3
900	8.7	9	+ .3				

The only important difference—the warmer surface in 1873—is no doubt due to the fact that observations were taken in May, 1873, and in February, 1914.

Off the west slope of the Bermudas the temperature of the mid-depths was much higher in 1914 (*Bache* stations 10173–10177) than in 1873, though in the abyss and above about 700 meters there was little difference (fig. 3). This divergence seems to have been a local, not a general, phenomenon, for the two *Challenger* stations within 100 miles west and northwest of Bermuda (no. 37 and 38) agree much more closely with *Bache* station 10171 (fig. 3). So far as these records go there seems to have been little difference in the temperatures of 1873 and 1914 in this part of the Atlantic as a whole; but the water in the neighborhood of Bermuda was much more uniform in 1873 than in 1914, when there was a very considerable variation of temperature at 800 to 1,200 meters between stations west (10177) and others south of the island.

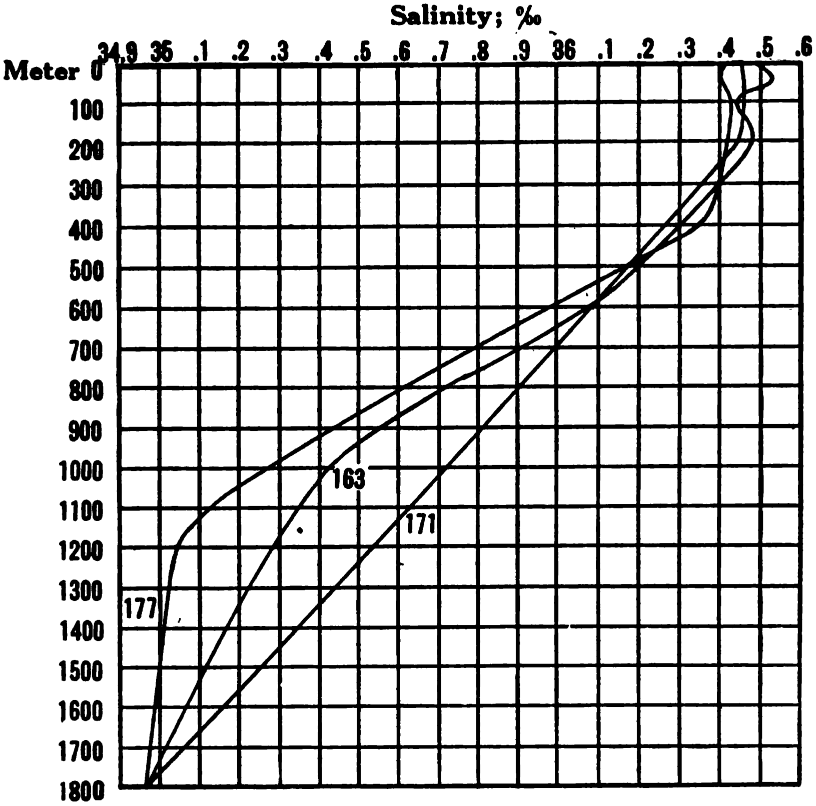

FIG. 7.—Salinity sections between the continental slope off Chesapeake Bay and Bermuda; stations 10163, 10171, 10177.

The salinity curves, like those for temperature, all approach a nearly uniform value at 1,800 meters, viz, 34.9–35°/₀₀; and, like the temperatures, they show the greatest variations in the middepths between 500 to 1,500 meters, the extreme range at 1,200 meters being only 7°/$_{00}$ (34.8–35.5°/$_{00}$). The salinity of the mid-depths, like the temperature, was highest west of Bermuda, where water of 35.2 per cent was encountered at about 1,500 meters; lowest north and northeast of the Bahama Bank (stations 10193, 10210, 10212) and in the northeast Providence Channel (station 10196), where water of this salinity was within 700–800 meters of the surface. So far as I can learn, no serial salinities have previously been taken by modern methods in the region in question, the *Challenger* records being all open to suspicion because of unreliable water bottles.

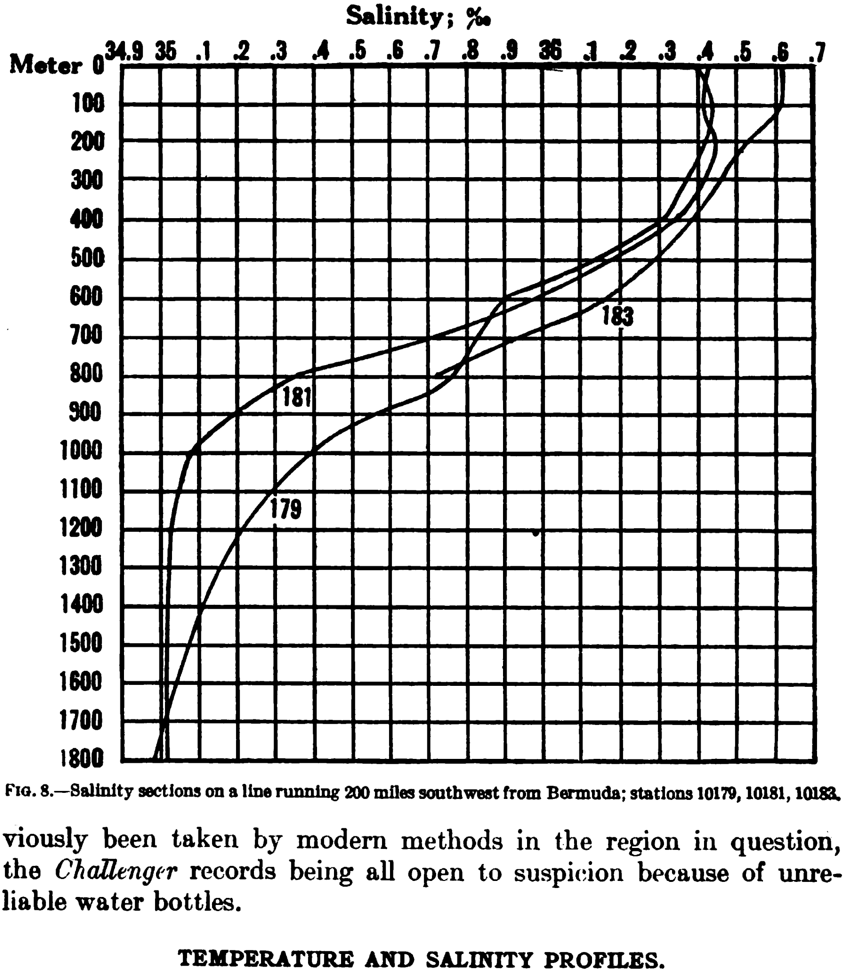

FIG. 8.—Salinity sections on a line running 200 miles southwest from Bermuda; stations 10179, 10181, 10183.

TEMPERATURE AND SALINITY PROFILES.

The profile from Chesapeake Bay to Bermuda (fig. 11) is necessarily interrupted between stations 10161 and 10163, owing to the zigzag course followed. (See chart.) On this line water warmer than 20° was confined to a narrow surface belt just east of the 1,800-meter contour on the continental slope (station 10161), with a secondary band at station 10165; otherwise the temperature was very uniform east of station 10163 above 650 meters, the curve for 15° being almost horizontal at that level, to swing up to the surface near the land as described elsewhere (p. 47). And, again, the temperature was nearly uniform at 1,800 meters east of station 10163. But in the middepths there is a very pronounced upwelling of cold water, revealed by the curves for 5° and 10°, in the center of the profile, between 800 and 1,600 meters. At the western (landward) end of the profile all the curves swing sharply upward, showing a very pronounced banking up of cold water against the continental slope, which need be merely mentioned here, being discussed at length on page 47, and there was evidently a minor banking up of abyssal water against Bermuda below 1,200 meters. Down to the 700-meter level salinity (fig. 12) agrees closely with temperature, the curve for 36°/₀₀ practically coinciding with 15°, the warm surface water at station 10164 finding its counterpart in high salinity (36.5°/₀₀). On the continental slope the successive curves for salinity dip, like those for temperature, very steeply from west to east—i. e., they afford

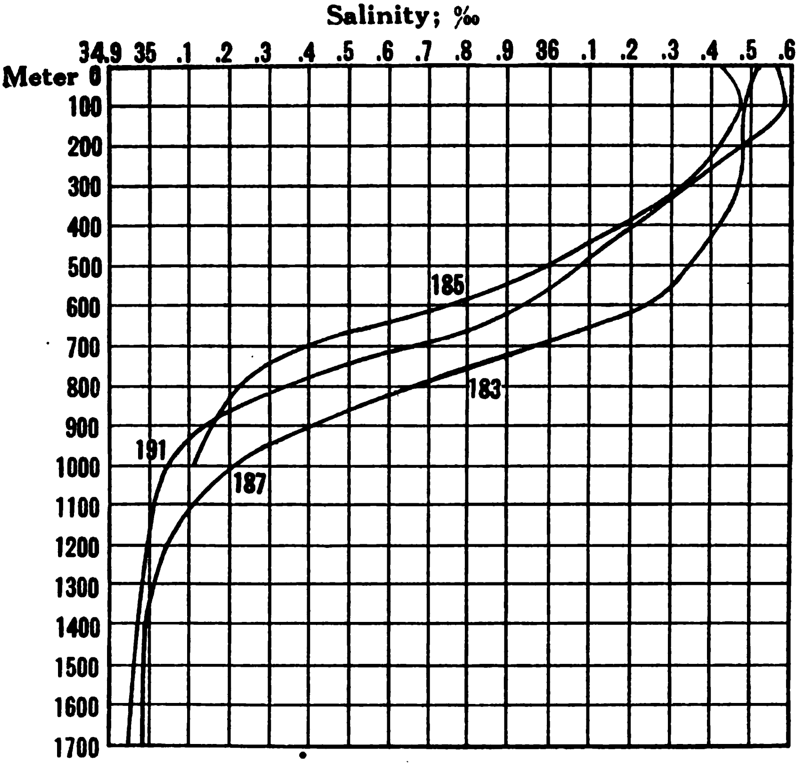

FIG. 9.—Salinity sections between Bermuda and the Bahamas; stations 10183, 10185, 10187, 10191.

further evidence of the banking up of abyssal water, and of water from the middepths, against the slope. The curves show that the salinity was rather higher in the middle of the profile than either farther west or farther east, instead of lower, like the temperature; but on the slope of the Bermudas salinity, like temperature, suggests a slight upwelling of abyssal water—i. e., it is only in the midlayers that salinity and temperature fail to agree. Below about 1,800 meters abyssal water with practically uniform salinity ($34.9^{\circ}/_{oo}$) was encountered.

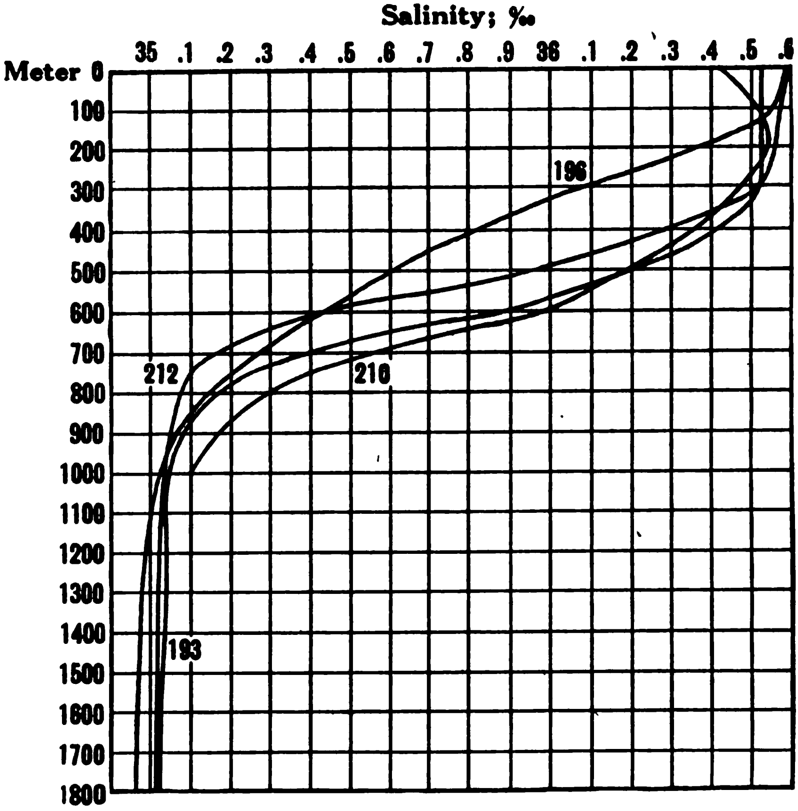

FIG. 10.—Salinity sections east of the Bahama Bank; stations 10193, 10210, 10212, and down to 1,800 meters in the northeast Providence Channel, station 10196.

The upper layers of water were colder over the southern slope of the Bermuda Bank (station 10179, fig. 13) than over the northern (station 10177, fig. 11), the difference being greatest (3°) at 1,200 meters; but below 1,400 meters the northern slope was the coldest. Along the line running southwest from Bermuda (fig. 13) the surface layers grew gradually warmer toward the south, the curve for 15° dipping from 550 to 700 meters, while near the surface the temperature rose from about 18° to 20°, and the peculiar S-shaped curve for 20° suggests an active mixing of cool and warm surface water. In the deeps, below 700 meters, the curves reveal a pronounced upwelling of cold abyssal water at station 10181, and the salinity profile (fig. 14) along this line shows much the same thing, the surface layers down growing salter, from north to south, while in the deeper layers salinity, like temperature, curves rise at station 10181.

The temperature profile from Florida to a point 200 miles southwest of Bermuda (fig. 15) shows that water warmer than 20° was thickest near the Bahama Bank (about 200 meters). East of this the curve of 20° rises to 50 meters at station 10191, then dips, as a tongue, to 150 meters at station 10189, where the surface was 19.6°. But 20° water is again seen at the eastern end of the profile. The curves for 15°, 10°, and 5° are roughly parallel with each other, showing a succession of cold and warm undulations, but, as a whole, dipping from west to east, the former from about 500 to about 700 meters, the latter from about 1,100 to about 1,600 meters. The most striking of these undulations is a well-developed cold band some 300 miles southwest of Bermuda (station 10185), and this is evidenced by an upswing of the curves down to 1,800 meters, as well as by lowered surface temperature. Immediately east of it, however, the water, as a whole, is warmer than anywhere else along the profile. The temperature then falls toward the west from station 10187 to station 10212; but there is a well-marked warm band over the 1,800-meter contour on

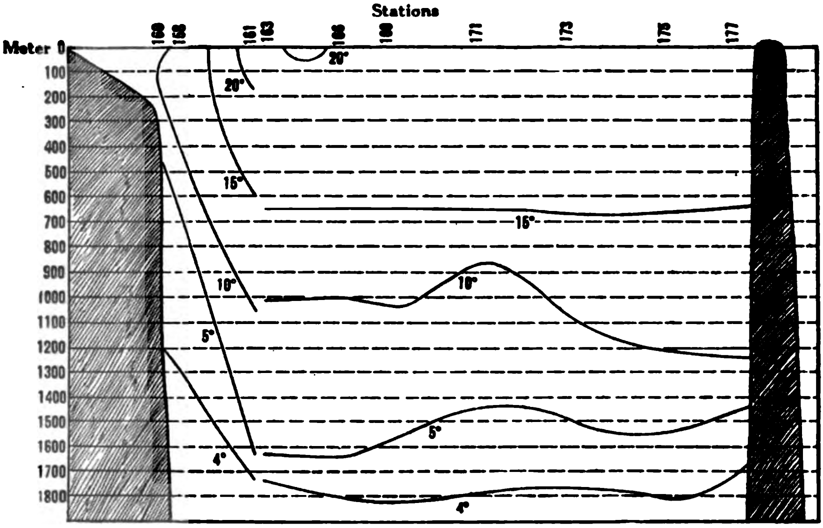

FIG. 11.—Temperature profile of the upper 1,800 meters from Chesapeake Bay to station 10161; and from a point 130 miles south of the latter to Bermuda.

the slope of the Bahama Bank. The temperature sections along this line (fig. 5, 6) show that practically the entire cooling from the surface downward takes place in the upper 1,500 meters; and below about 1,800 meters the west-east dip is still evident. The profile illustrates sufficiently the contrast between the Antilles water on the one hand and the Florida current water on the other, for while the latter is even warmer than the former on the surface, water colder than 10° comes much nearer the surface in it, what we may call an entire oceanic section being compressed into a channel only some 700 meters deep, and the banking up of cold bottom water on the left-hand side is much more extreme in the Florida than in the Antilles current.

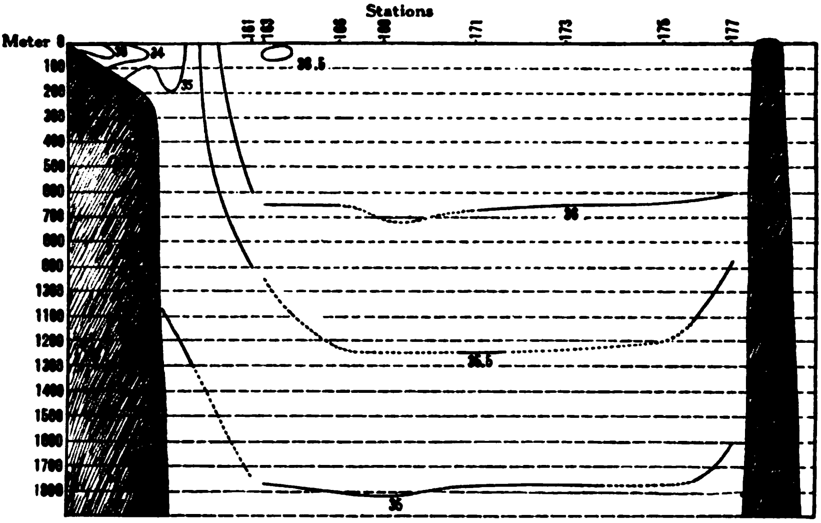

FIG. 12.—Salinity profile of the upper 1,800 meters, Chesapeake Bay to station 10161, and from a point 130 miles south of the latter to Bermuda.

Salinity (fig. 16) agrees very well with temperature along this profile down to 1,200 meters. Thus, the curve of 36°/$_{00}$ is almost exactly parallel with that of 15°; the curves of 35.5°/$_{00}$ and 35.3°/$_{00}$ roughly, though not exactly, parallel with 10° and 5° temperatures, respectively. Consequently, below 500 meters the two combined show a mass of warm water of high salinity south of Bermuda; a band of cool, comparatively fresh water at station 10185; next, a second warm salt mass about 300 miles southeast of Bermuda, followed by a general cooling and decline of salinity as far as the 1,800-meter contour on the slope, where there is a third well-marked warm salt band. Between the 500-meter level and the surface the general trend of the salinity curves is different, the saltest water as a whole lying northwest of the Bahama Bank, where there is a layer about 300 meters thick with salinity above 36.5°/$_{00}$. Farther east this strikingly saline layer is much thinner and it is twice interrupted (stations 10189 and 10185), though it once more appears near Bermuda. Over the northern end of the Bahama Bank the 36.5°/₀₀ water is overlaid by fresher water, as described for the Jupiter Inlet profile across the Florida current (p. 32). Below 1,200 meters there is very little further decrease in salinity: At 1,800 meters it ranges from 34.96 to 35.01°/₀₀ only, and judging from what is known of Atlantic bottom water (Murray and Hjort, 1912; Nansen, 1912), it is probably practically uniform below that depth. Though the curve of 35°/₀₀ suggests a slight upwelling of this abyssal water in the center of the profile, the entire range of variation of salinity below the 1,000-meter level is so small that it is doubtful whether this was really the case. Certainly, temperature suggests nothing of the kind but just the reverse.

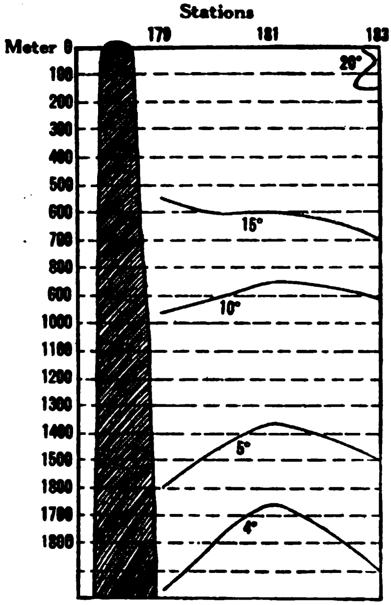

FIG. 13.—Temperature profile of the upper 1,800 meters, on a line running 200 miles southwest from Bermuda.

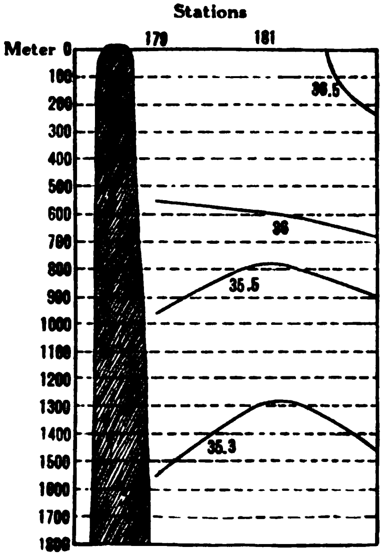

FIG. 14.—Salinity profile of the upper 1,800 meters, on a line running 200 miles southwest from Bermuda.

The relationship of these profiles to one another may be illustrated further by charts of the temperatures and salinities at the 200, 600, 1,000, and 1,800 meter levels.

At 200 meters salinity was remarkably uniform, the extreme range, except for the cool, fresh water next the coast (station 10158, p. 45), being from 36.42°/₀₀ to 36.55°/₀₀ only. The temperature range (fig. 17) was also very small, 18.1° to 19.3° over most of the area. Next the coast off Chesapeake Bay it was much colder (11.2° at station 10158); but east of station 10161 the temperature at this level was nowhere below 18°. Off the mouth of the Straits of Florida and off the northeastern slope of the Bahama Bank (station 10210) the 200-meter temperature rose to 20°, and it was even warmer (22°) in the northeast Providence Channel (station 10196). The course of the curve of 19° is worth notice, since it shows a tonguelike extension of warm water parallel with the coast, recalling the surface (fig. 1). But this phenomenon was limited to the upper 300 to 400 meters, for at 600 meters (fig. 18) the water was warmest (16°) west of

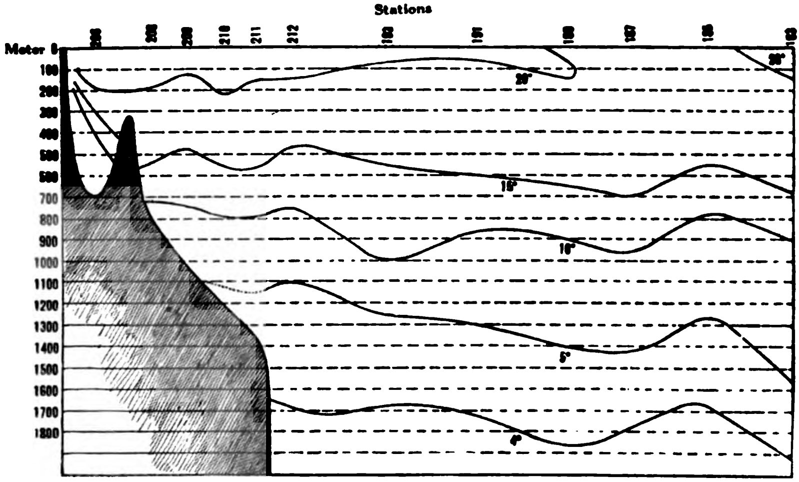

FIG. 15.—Temperature profile of the upper 1,800 meters, from Florida to a point 200 miles southwest of Bermuda.

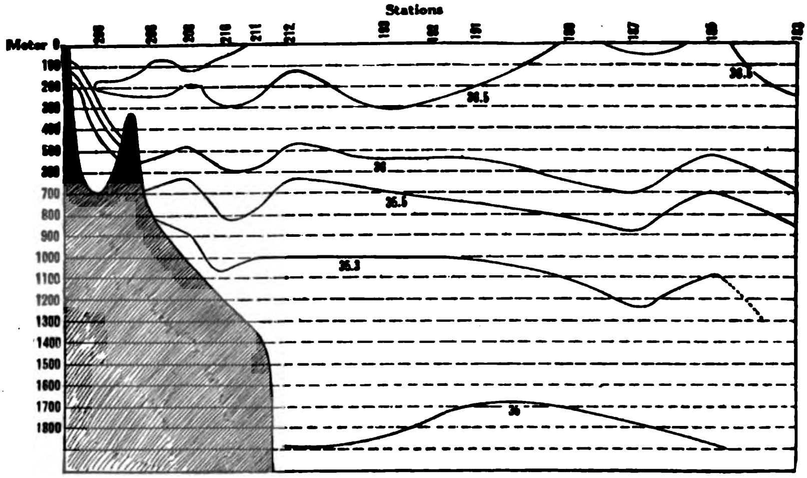

FIG. 16.—Salinity profile of the upper 1,800 meters, from Florida to a point 200 miles southwest of Bermuda.

Bermuda, over a roughly oval area with slightly colder (15°) water on the east, south, west, and, probably, on the north also. South of Bermuda the temperature was below 15°. And it was even colder (12°) off the Bahama Bank, falling to 10° in the northeast Providence Channel, and probably all along the continental slope, with a temperature of only about 5° off Chesapeake Bay at this level. The extension of a tongue of 12° northward from the Bahama Bank suggests that part of the cold water, which is banked up against the latter, is drawn here into the general northerly drift of the Antilles current; but apparently the cold water at station 10185 was the result of local upwelling, not of a cold band.

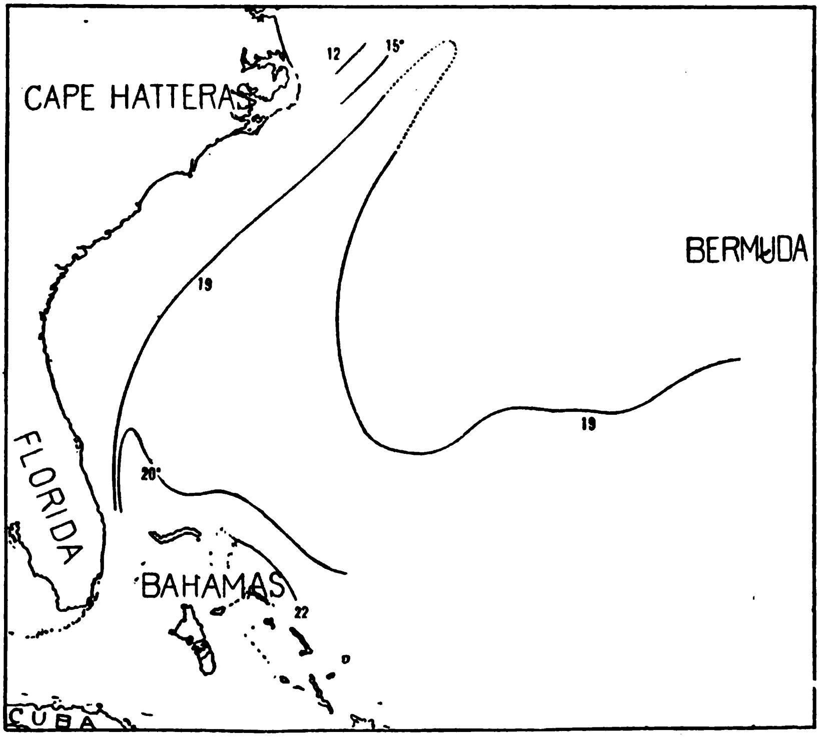

FIG. 17.—Temperatures at 200 meters.

The distribution of salinities at 600 meters (fig. 19) suggests, although it does not parallel, the temperature, the water being saltest (over 36.1°/₀₀) west of Bermuda, where the curve of 36°/₀₀ incloses a roughly oval area, which was probably limited by water of lower salinity on the north, as it certainly was on the east, south, and west. The low salinity of station 10185 is as clearly a local phenomenon, as is its low temperature. Over the southwestern part of the area in general the salinity was very uniform (36–36.08°/₀₀); but north of the Bahama Bank and along the continental shelf the water was much fresher, its salinity falling to about 35.5°/₀₀ off the northeast slope of the bank, as far as station 10212, and in the Providence Channel, to 34.9°/₀₀ in the exit of the Straits of Florida (station 10206), and to about 35.1°/₀₀ off Chesapeake Bay. Thus, the low temperature and salinity which characterize the surface waters west of Bermuda (p. 6, 7) were limited to a shallow zone, this being the warmest and saltest area at the 600-meter level. Similarly the very high surface temperature at the mouth of the Straits of Florida and northeast of the Bahamas in general was equally superficial, cold water rising nearer to the surface there than over the oceanic basin.

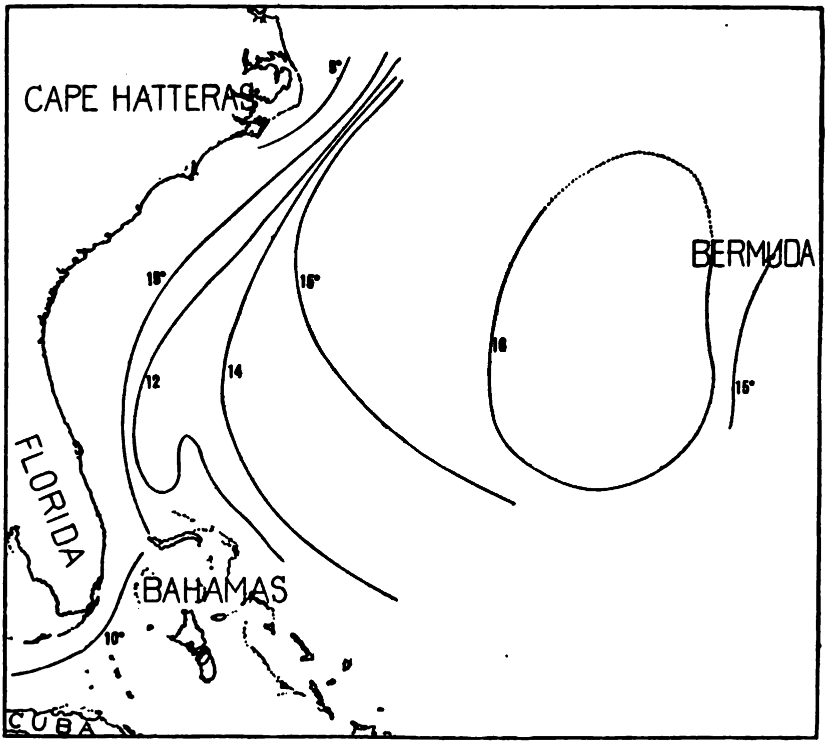

FIG. 18.—Temperatures at 600 meters.

At 1,000 meters conditions are puzzling. It is clear that the temperature at this level was highest (12°–13°) northwest of Bermuda, and that most of the area studied was about 10°, with cooler water near the coast—i. e., that the general distribution of temperature was essentially similar to that of the 600-meter level. But the low temperatures (about 7°) at stations 10181, 10183, 10185, and 10171, suggest a tongue of cold water, extending from southeast to northwest, right across the area traversed by the *Bache*, which has no counterpart at the higher level. Its outline forbids the assumption that it can be northern water, unless in the form of an upwelling. However, the existence of such a tongue depends on the temperature reading at station 10171, and as this is not accompanied by correspondingly low salinity, but the contrary, it is natural to wonder whether it is correct. Discarding this one reading, the warm (10°) water would hardly be indented on the southeast (fig. 20), and the temperature curves would agree much more closely with the salinities. The lowest temperatures at this level were off Cape Hatteras (4°–5°) and off the Bahama Bank, and it is probable, though not certain, that there was a continuous belt of cold water all along the continental slope. Salinity (fig. 21) like temperature at 1,000 meters was highest northwest and west of Bermuda, with a similar slight indentation by fresher water on the southeast. Although the salinity, unlike the temperature, is practically uniform over a considerable area east and northeast of the Bahama Bank—i. e., affords no evidence of upwelling on the slope—this apparent difference is not essential, because the comparative uniformity of salinity below 1,000 meters makes it a far

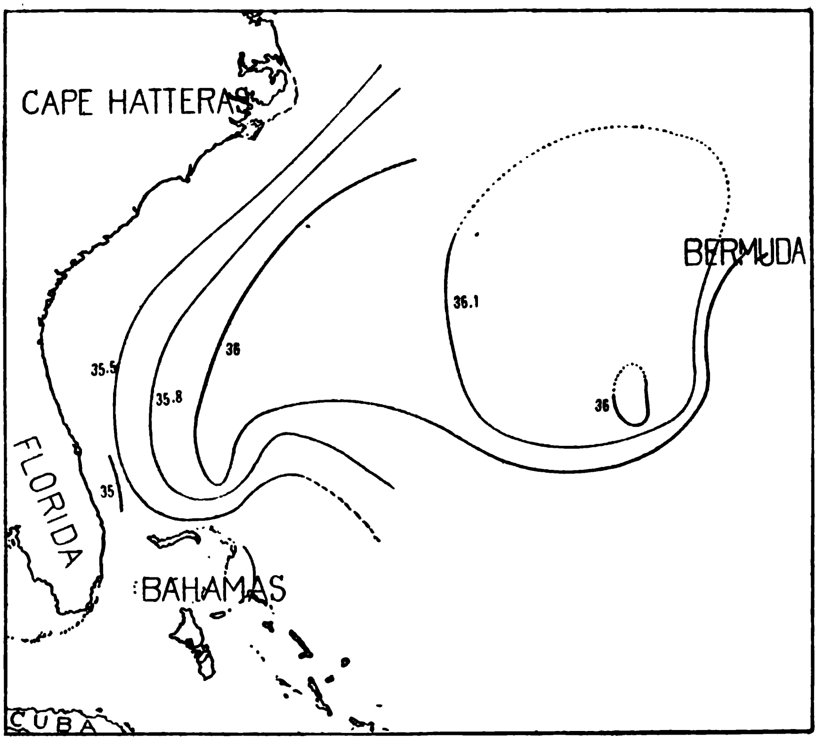

FIG. 19.—Salinity at 600 meters.

less obvious index to upwelling than temperature at this or greater depths. At 1,800 meters the temperature was very nearly uniform, the extreme range being only from 3.5° to 4.2°, with water as warm as 4° for approximately 400 miles west of Bermuda. At this level the extreme range of salinity was only 0.07°/₀₀ (34.94–35.01°/₀₀), water of 35°/₀₀ occupying an elipse between Bermuda and the Bahamas, apparently surrounded by slightly fresher water—i. e., roughly corresponding to the area of highest temperature at this level. Thus, the effect of the warm salt water of the Florida and Antilles currents, so noticeable on the surface, is hardly to be traced below 600 meters, by either salinity or temperature. On the contrary, the cold, comparatively fresh water of the deeps rises nearer to the surface under them than in the region west of Bermuda, and apparently this is also the case south and east of Bermuda. Thus we have, west of Bermuda, a mass of water distinguished by high temperature and salinity, from about 200 down to 1,800 meters.

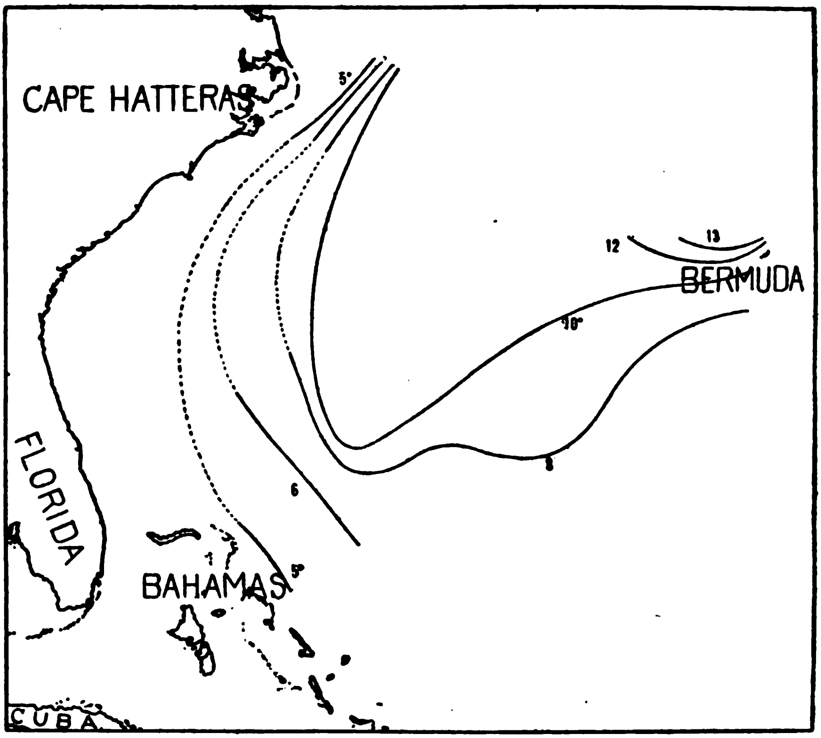

FIG. 20.—Temperature at 1,000 meters.

There is, of course, nothing novel in the observation that the water, as a whole, is warmer west of Bermuda than farther south or east—i. e., that the cold abyss water is farther from the surface. Indeed, the general approach of the water of the abyss toward the surface, from about latitude 30° toward the Equator, is one of the most essential features of oceanic temperature and one of the most significant in its bearing on the general system of oceanic circulation.[a]

It is interesting that while the 600-meter temperatures of the *Bache* agree very well with earlier records, the warmest water west and northwest of Bermuda being 16.3°–16.5°, as against 16.8° as given by Schott (1902), at 1,000 meters the *Bache* records are notably warmer, 13° as against 8.2°, according to Schott (1902, 1912)—that is to say, the abyss water was farther from the surface—and even at 600 meters the area of 6° water extended farther to the south (to about 28° north latitude) than it is represented by Schott (about 31° north latitude), though hardly as far to the westward. Otherwise, the *Bache* and *Valdivia* charts agree very well for this level. Even at 1,000 meters, the geographic location of the absolute maximum is very nearly the same in Schott's chart as in our own. In short, the work of the *Bache* corroborates in general the earlier temperature records; but the salinities are a distinct addition to oceanography, there

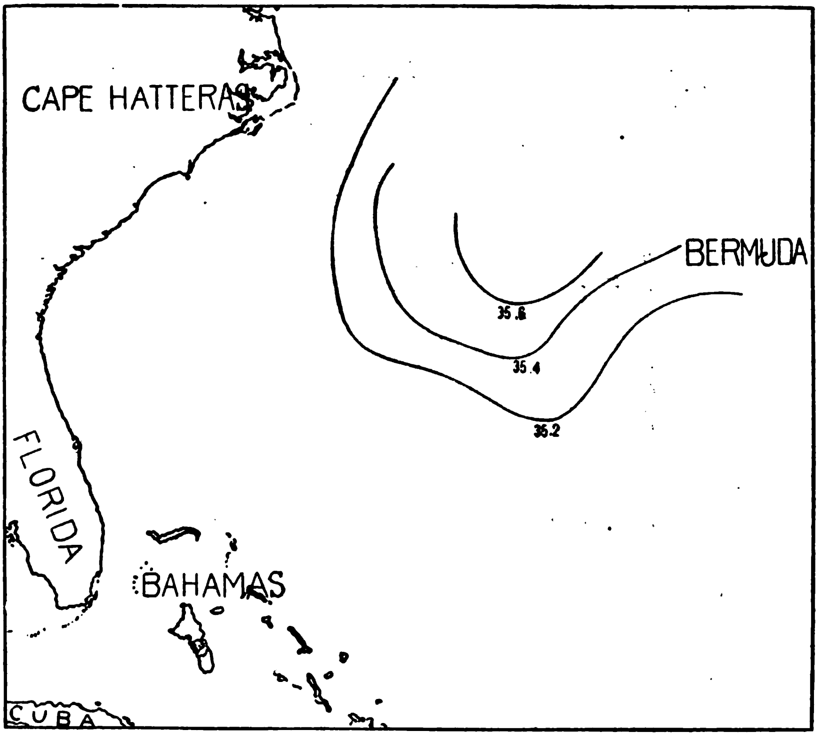

FIG. 21.—Salinity at 1,000 meters.

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[a] For an excellent account of this phenomenon, see Schott (1912), p. 130.

being practically no previous records for the middepths in this region. The discovery that the general distribution of salinity is the same as that of temperature—i. e., highest west of Bermuda (except on the immediate surface)—is a further corroboration of the upwelling of abyssal water toward the Equator.

THE STRAITS OF FLORIDA.

The Straits of Florida are historic grounds for oceanographic study, thanks to the temperatures taken by the *Blake* (Agassiz, 1888) and to the numerous current measurements made by the United States Coast and Geodetic Survey, especially by Capt. Pillsbury (1886, 1887, 1889). However, it remained for the *Bache* to obtain satisfactory series of salinities, simultaneous with temperatures. Three profiles were drawn across the Straits—one from Key West to Habana, one from Cape Florida to Gun Cay (coinciding with the *Blake* and with Pillsbury's profiles), and the third from off Jupiter Inlet to the northern end of the Little Bahama Bank.

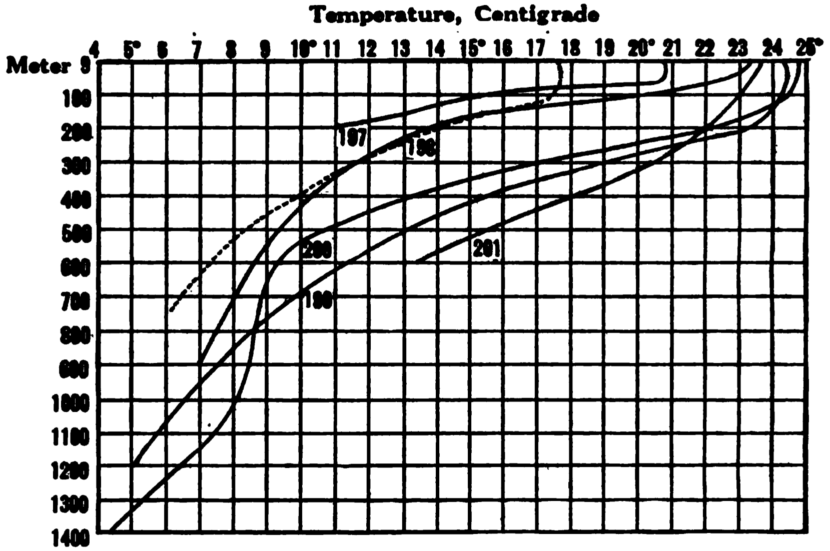

FIG. 22.—Temperature sections on the line Key West-Habana; stations 10197, 10198, 10199, 10200, 10201; and off Pensacola, Fla., March 13, 1885 (......, *Albatross*).

The *Bache* found a general rise in surface temperature, from north to south, along the whole length of the channel, the water being warmest (24.70°) approximately 20 miles from Habana—i. e., in the position of the axis of the Florida current at low declination of the moon. The surface was cooler immediately off Key West than anywhere else in the Straits (station 10197, 20.78°) with a slight but progressive warming along the Florida coast from southwest to east and north.

Water warmer than 24° was confined to the southern and western part of the channel, and the water in the Old Bahama Channel was probably as warm as 24°, while the surface was fractionally cooler along the western face of the Bahama Bank. At the northern end of the channel the surface temperature was 23.6°–23.7°, and it was considerably cooler east of the Bahama Bank, as pointed out (p. 6). Thus, the inequalities in surface temperature are gradually dissipated from west to east and north, the temperature range diminishing from 4° off Habana to practically zero off Jupiter Inlet. As a whole, the Straits were considerably warmer on the surface than the Atlantic water east of the Bahama Bank.

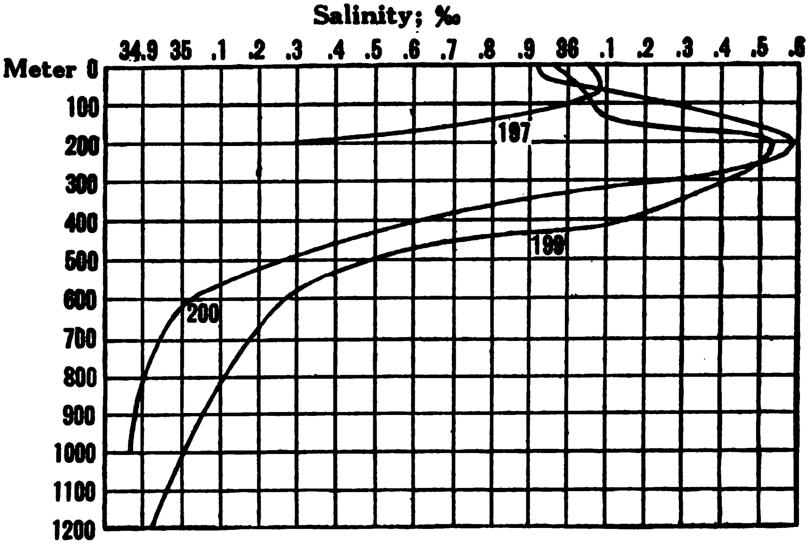

FIG. 23.—Salinity sections on the line Key West–Habana; stations 10197, 10199, 10200.

The surface salinity was much more uniform than the surface temperature, the extreme range over the whole length of the channel being about 0.27°/₀₀ only (35.9° to 36.17°/₀₀).

The serial observations on the Key West-Habana line (fig. 22, 23) show that off Key West the water cooled from nearly 21° on the surface to 11° at 200 meters; 20 miles farther south from 23° to 14°; in the center of the channel only from 23.5° to 22° in the same depth. Below that depth the curves of the temperature sections on this line approach each other, the temperature range at 900 meters being only 1.5° (7°–8.5°). The warmest station was in the center of the Strait (station 10201). Unfortunately, serial water samples were taken at only three of these five stations (none at station 10201, perhaps the most interesting of all). However, they show that the salinity was lowest immediately off Key West (station 10197), and that in the southern half of the channel (stations 10199 and 10200) the saltest water (about 36.5$^{\circ}/_{\circ\circ}$) was at 200 meters, with 36$^{\circ}/_{\circ\circ}$ water on the surface above it. Below the 200-meter level there was a rapid vertical decline of salinity to about 35–35.2$^{\circ}/_{\circ\circ}$ at 600 meters, followed by a much slower decrease, to about 34.9$^{\circ}/_{\circ\circ}$ at 1,100–1,200 meters. The temperature and salinity profiles (fig. 24, 25) constructed from these sections show that water colder than 10°, and with salinity lower than 35$^{\circ}/_{\circ\circ}$, was banked up against the Florida slope to within 200–300 meters of the surface. On the Cuban side of the profile water of 35$^{\circ}/_{\circ\circ}$ was met only below about 900 meters (10° water at 700 meters). The coldest water of all (4°–5°) lay on the bottom off Habana below 1,300 meters, and water equally cold may have filled the trough below this depth, but we have no records from this or greater depths on the north side. Perhaps the most striking feature of the profile apart from the cool fresh water off Key West is the band of warm water at 100–800 meters in the center of the channel outlined by the curves for temperatures between 10° and 20°. In the middepths this band was even warmer than the water next to the Cuban coast; but the surface water was warmest on the Cuban side where there was a surface layer about 100 meters thick of 24°–25°.

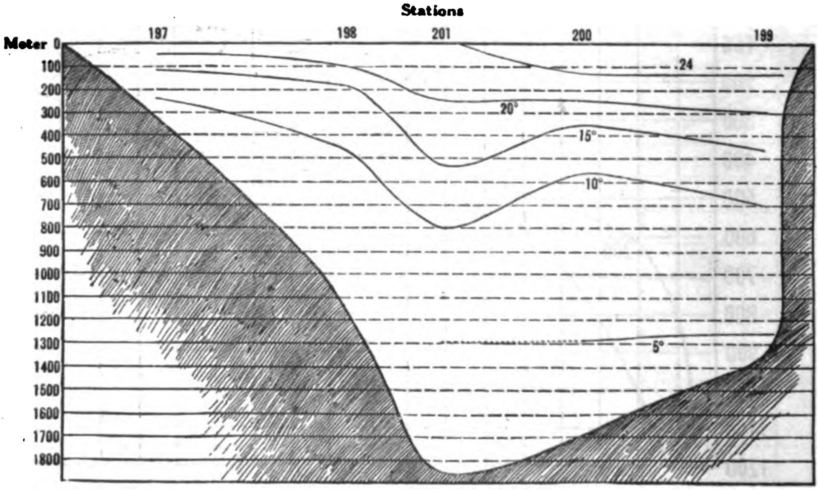

FIG. 24.—Temperature profile, Key West–Habana.

Unfortunately, the salinity profile is not complete, there being no salinities for the middepths at stations 10198 or 10201; hence it is a question whether the warm band just mentioned was characterized by high salinity as well as by high temperature. There is nothing in the data from the other stations along this line to forbid such an assumption. The range of surface salinity was only about

0.17°/₀₀ (from 35.93 to 36.1°/₀₀), the surface being freshest on the Cuban side, above the saltest water (36.5°/₀₀), as just noted.

Apart from a possible salt tongue in the center of the channel, the salinity curves as a whole dip from north to south, and it is worth noting that the same vertical range of salinity (36 to 35°/₀₀) which occupies 900 meters at the southern end was condensed into 250 meters at the northern end of the profile.

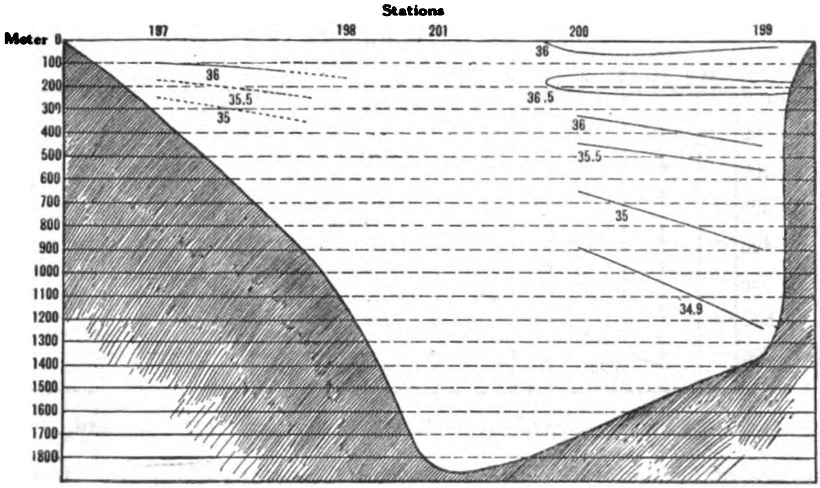

FIG. 25.—Salinity profile, Key West-Habana.

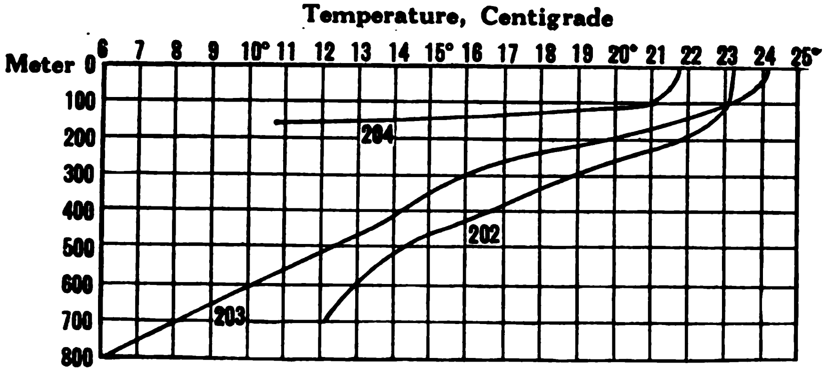

FIG. 26.—Temperature sections on the Gun Cay-Cape Florida line; stations 10202, 10203, 10204.

Between Cape Florida and Gun Cay the channel is only about 900 meters deep and 60 miles wide. Nevertheless, we find as great a range of salinity (fig. 27) and almost as great a range of temperature (fig. 26) as in the Key West-Habana profile. As before, the water was coldest and freshest next to Florida, warmest and saltest off the Bahama Bank; and the two eastern stations are saltest (36.5°/₀₀) at 200 meters, below which level there is a rapid decrease of salinity to 34.85°/oo at 800 meters in the center of the channel, and to 35.5°/oo at 700 meters off Gun Cay.

At all three stations along this line the vertical cooling was rapid, the temperature dropping off Cape Florida from 21° to 10.5° in a distance of 50 meters; from 24° on the surface to 6° at 800 meters in the center of the channel; from 23° to 12° in 700 meters off Gun Cay. The temperature profile (fig. 28) shows no trace of the warm tongue so conspicuous between Key West and Habana, and the warmest water (24°–25°) was on the surface in the center of the channel, instead of on the Bahaman side, besides being fractionally cooler than the highest surface temperatures off Habana. The banking up of water colder than 10° and fresher than 35°/oo against Florida is even more pronounced than in the preceding profile, water with these characteristics rising to within about 175

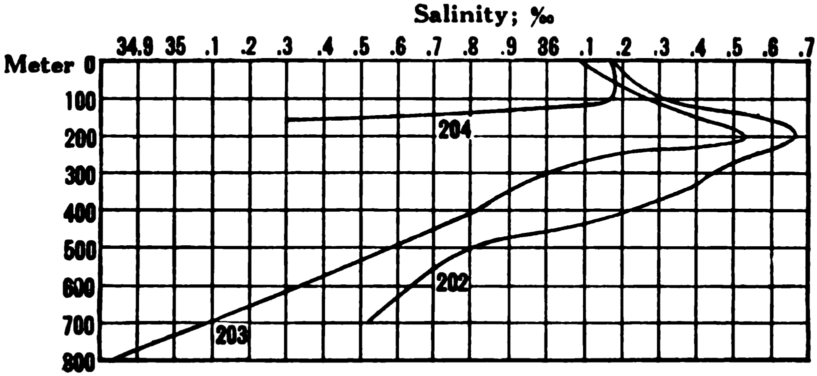

FIG. 27.—Salinity sections on the Gun Cay-Cape Florida line; stations 10202, 10203, 10204.

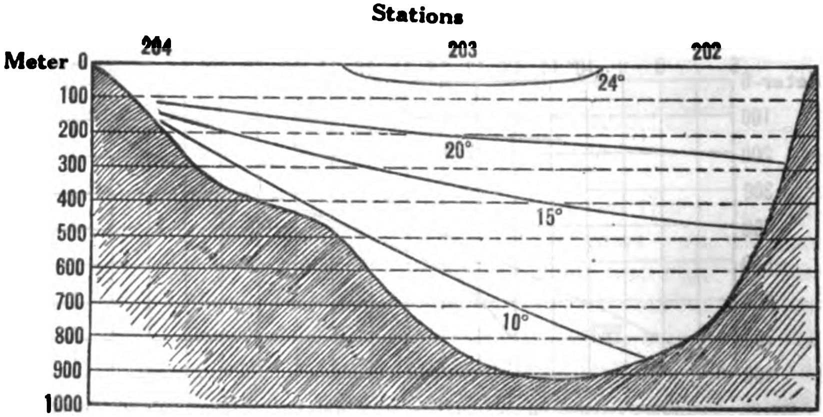

FIG. 28.—Temperature profile across the Straits of Florida, Gun Cay-Cape Florida.

meters off Cape Florida; to about 250 meters off Key West. The same lenticular mass of 36.5°/₀₀ water (fig. 29) is to be seen on the Bahaman side and at the same level (200 meters), as off Cuba in the Key West-Habana profile. As in the latter, the surface is freshest where warmest, though this is now in the center of the Strait instead of on the Bahaman side. The whole range of surface salinity is only about 0.1°/₀₀. The curves for temperature colder than 20°, and salinities lower than 36°/₀₀, dip regularly from west to east, the curves for 36°/₀₀ and 15° coinciding almost exactly with each other, and the slope growing progressively steeper with decrease of temperature and salinity. The saltest and coldest water was in the deepest part of the channel, 34.85°/₀₀ and 6.16° at 800 meters.

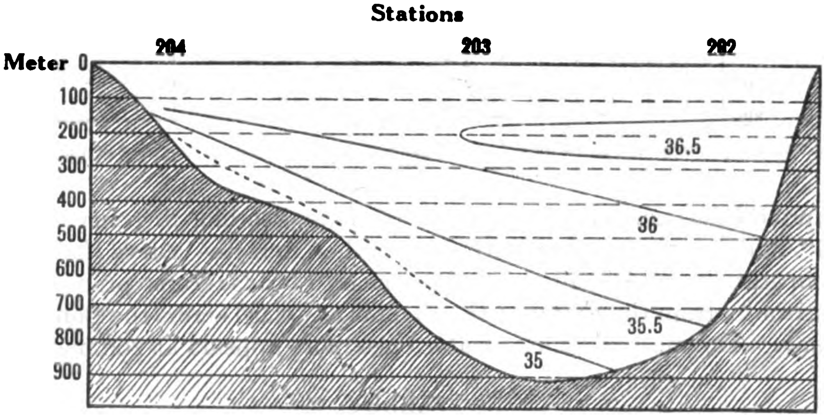

FIG. 29.—Salinity profile across the Straits of Florida, Gun Cay to Cape Florida.

Comparison between these two profiles shows that the subsurface temperatures between Cape Florida and the Bahama Bank agree very closely with those of the northern half of the Key West-Habana profile, the curve for 20° dipping from 25 or 30 meters near Florida to about 250–275, the curve for 15° to about 500 meters in both, but below 500 meters the Cape Florida profile is considerably the colder of the two, depth for depth, its 800-meter temperature being about the same as at the 1,200-meter temperature between Key West and Habana. There was probably a similar difference in salinity, though owing to the lack of data at stations 10198 and 10201 complete comparison is not possible.

We find the same general type of temperature and salinity sections (fig. 30, 31) along the Jupiter Inlet-Bahama Bank line, the water saltest at 200 meters, warmest on the surface, with the same general rise in temperature and salinity from west to east. The total range of both is as great as before, but the depth of the channel having decreased to only 700 meters, the vertical increase is even more rapid than on the Cape Florida line.

In the profiles (fig. 32, 33) the curves for 15° and 10° temperatures and for salinities of 36°/₀₀ and less dip from west to east, water of 10° and 35°/₀₀ rising to within about 200 meters of the surface off Jupiter Inlet; and as was the case off Cape Florida, the curves for 15° and 36°/₀₀ coincide with each other, but the curve for 20° temperature, which likewise dips near Florida, runs practically horizontal from the center of the channel eastward across the Bahama Bank. The mass of 36.5°/₀₀ water once more appears at 200 meters; but instead of being limited on the east by a coast line, as was the case in the preceding profiles, it now extends across the northern end of the Bahama Bank, to join the 36.5°/₀₀ surface water farther east (fig. 16). There is no surface water as warm as 24° in this profile; but the difference between the warmest readings in it and

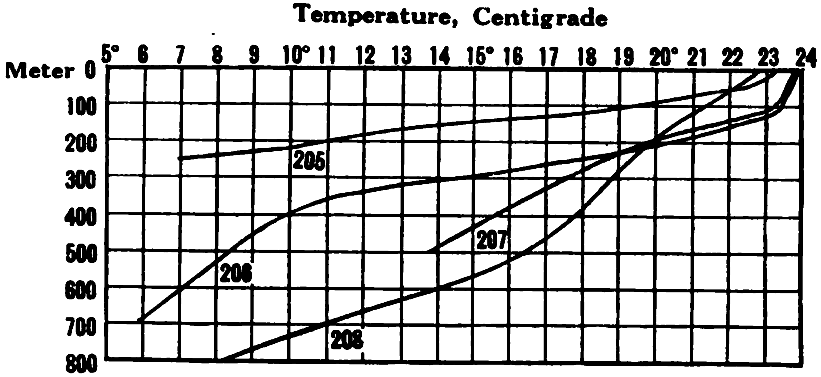

FIG. 30.—Temperature sections between Jupiter Inlet and the Bahama Bank, and east of the latter; stations 10205, 10206, 10207, 10208.

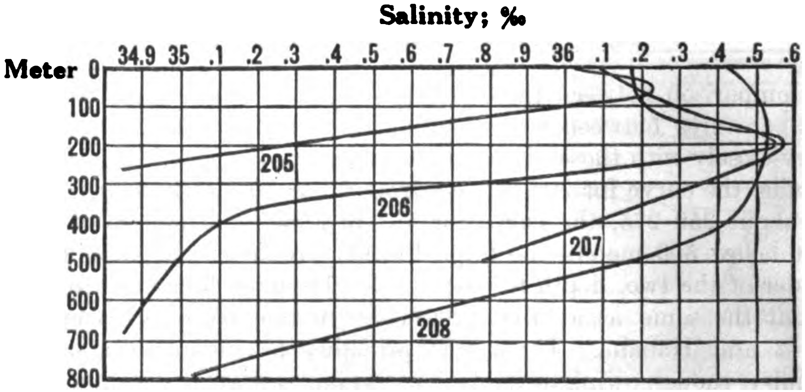

FIG. 31.—Salinity sections between Jupiter Inlet and the Bahama Bank, and east of the latter; stations 10205, 10206, 10207, 10208.

the preceding profile is only fractional, while the surface was more uniform, and the mean surface temperature was fractionally higher (23.7°) along the Jupiter Inlet than the Cape Florida line (23.04°). In the bottom of the channel the water was of practically the same temperature (5.7°) and salinity (34.85°/₀₀) as between Cape Florida and Gun Cay, 100 meters deeper.

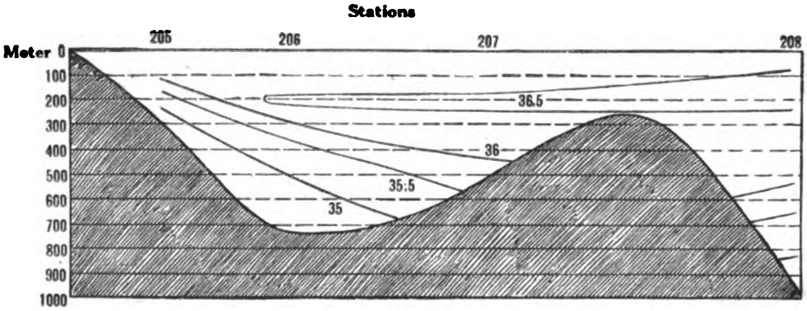

FIG. 32.—Temperature profile running east from Jupiter Inlet, across the northern end of the Bahama Bank.

The vertical condensation of salinity and temperature, and the general rise of cold fresh bottom water toward the surface from off Habana to the northern entrance of the channel is illustrated by an artificial profile lengthwise of the axis of the channel (fig. 34), reconstructed from the preceding transverse profiles. Several features deserve mention. The very warm surface water has been sufficiently emphasized. Beneath it lies a band of salter, cooler water (36.5°/₀₀ and 20°) extending the whole length of the profile, and continuous in both salinity and temperature with the surface water east of the Bahama Bank (p. 19, fig. 15, 16). Whether it is also continuous with the surface water of the Gulf of Mexico is not certain. Finally, at the northern end of the profile the rise of water of 6°–10° temperature and 34.8–35°/₀₀ salinity toward the surface is very evident; but water colder than 5° does not rise up the slope above the 1,100-meter level. Water of this temperature was also

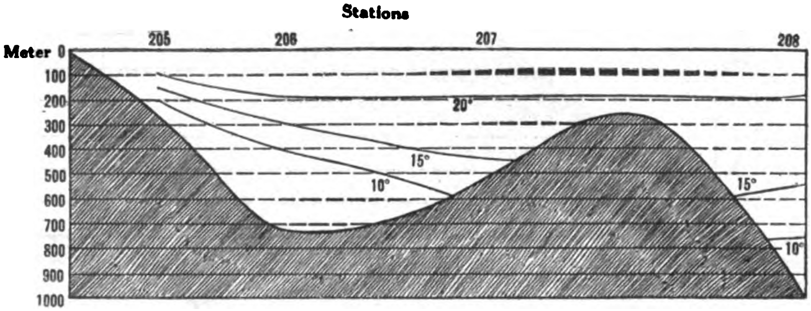

FIG. 33.—Salinity profile, running east from Jupiter Inlet, across the northern end of the Bahama Bank.

encountered at about this same level east of the Bahamas and also in the Providence Channel (station 10196).

The distribution of temperature and salinity may be further illustrated by charts of the 200, 400, and 600 meter levels.

At 200 meters (fig. 35) there was a general rise of temperature from north and west to south and east from about 10° close to the coast of Florida to 23° off Habana and 21.8° off Gun Cay. Opposite Jupiter Inlet, however, the warmest water (20.13°) was in the center of the channel at this level, with a fractionally lower reading (19.93°) off the northern end of the Bahama Bank. The range of salinity at this level was only 1.37$^{\circ}/_{\circ\circ}$ (35.3 to 36.67$^{\circ}/_{\circ\circ}$) with the water freshest close to the coast of Florida, while the salinity of the southern and eastern half of the channel ranged from 36.5 to 36.67$^{\circ}/_{\circ\circ}$ (fig. 36).

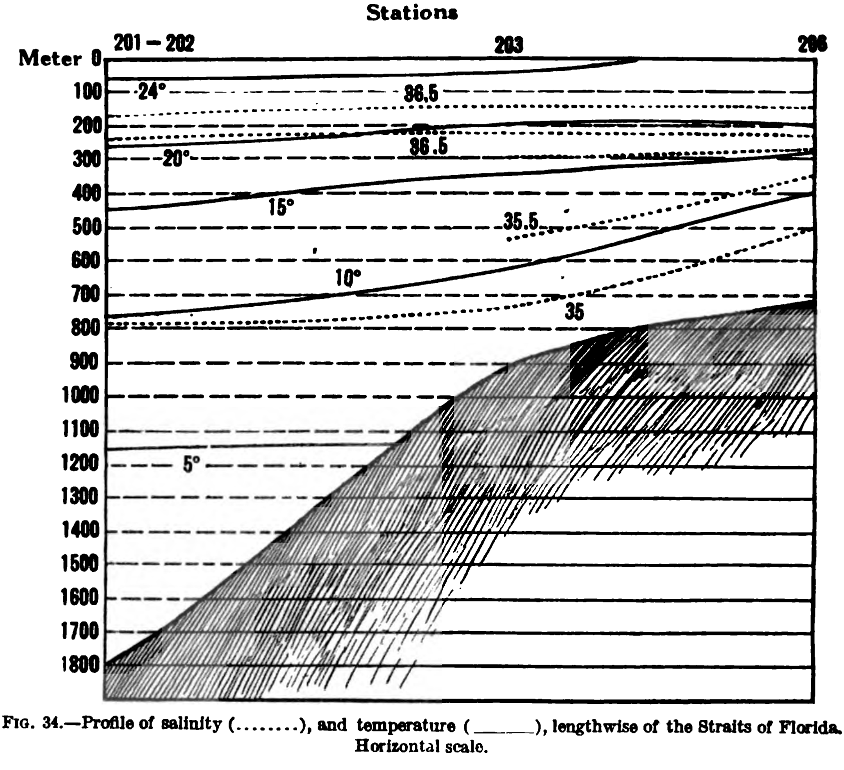

FIG. 34.—Profile of salinity (........), and temperature (______), lengthwise of the Straits of Florida. Horizontal scale.

At 400 meters (fig. 37) there was a general west to east warming in the northern half of the channel from about 9° near Florida to 16° near the Bahama Bank; but off Key West this was complicated by the warm tongue of 17° in the center of the channel, already described for the Key West-Habana profile. At this level the range of salinity (fig. 38) was from 35.1$^{\circ}/_{\circ\circ}$ (station 10206) to 36.2$^{\circ}/_{\circ\circ}$; lowest close to the coast of Florida, highest on the south and east side of the channel, the curves for 35.5 and 36°/₀₀ suggesting, although they do not precisely reproduce, the curves for 10° and 15° temperatures, respectively. The lack of data from the mid-depths at station 10201 leaves the possibility open that there may have been a tongue of still salter water at the west end of the channel, to correspond with the tongue of high temperature there.

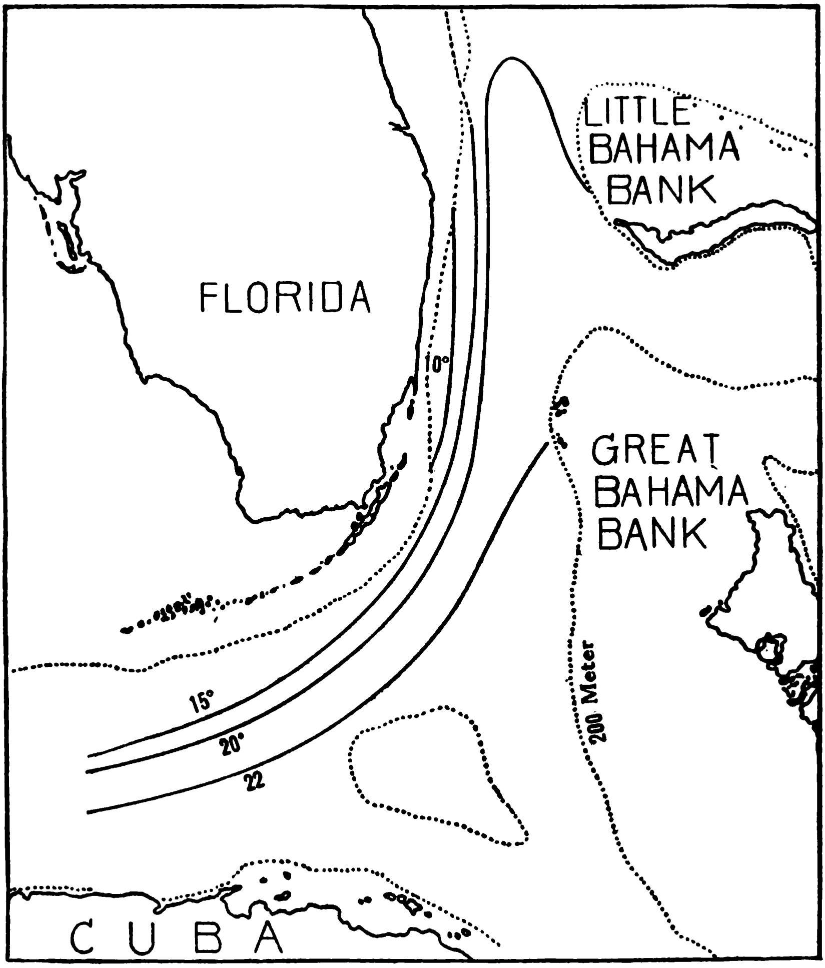

FIG. 35.—Temperature in the Straits of Florida at 200 meters, March, 1914.

At 600 meters, however (fig. 39), the warm water at station 10201 has lost its tonguelike character, being continuous with the general temperature (12°–13°) of the southeastern and eastern parts of the Straits. At this level the water was 7°–10° along the Florida side of the channel, and there was a second cold area off Habana (9°–10°), apparently a tongue from the west.

At 800 meters the distribution of temperature was much the same, coldest off Florida, and again off Habana, warmest in the center of the channel between Key West and Habana, and on the east side of the Straits, but the absolute value everywhere 1°–3° lower. Below 800 meters there was a general rise in temperature from north and west to south and east.

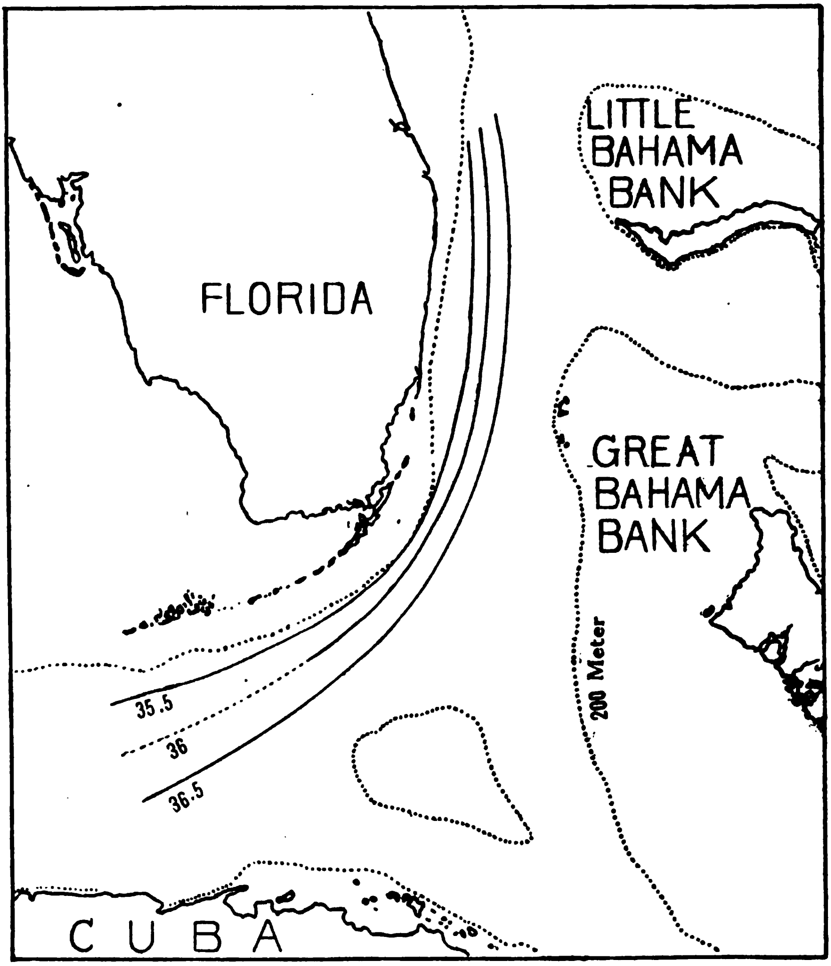

FIG. 36.—Salinity in the Straits of Florida at 200 meters, March, 1914.

Owing to the insufficiency of the records on the Key West-Habana line, it is not possible to plot the 600-meter salinity. In the northern half of the channel it ranged from about 34.9°/₀₀ off Florida to 35.6°/₀₀ off the Bahama Bank, the curve for 35°/₀₀ running, roughly, north and south. Judging from stations 10200 and 10199, where the salinity, respectively, was 35 and 35.27°/₀₀, and from station 10197, where it was 35.3°/₀₀ at 200 meters, there was probably a general rise, north to south, from below 35°/₀₀ to about 35.3°/₀₀ at 600 meters, at the west end of the Straits as well. This rise in salinity, from the Floridan to the Cuban and Bahaman side of the channel, is still traceable at 800 meters, where the salinity rose from 34.85–34.9°/₀₀ at stations 10200 and 10203 to 35.1°/₀₀ off Habana and 35.4°/₀₀ off Gun Cay.

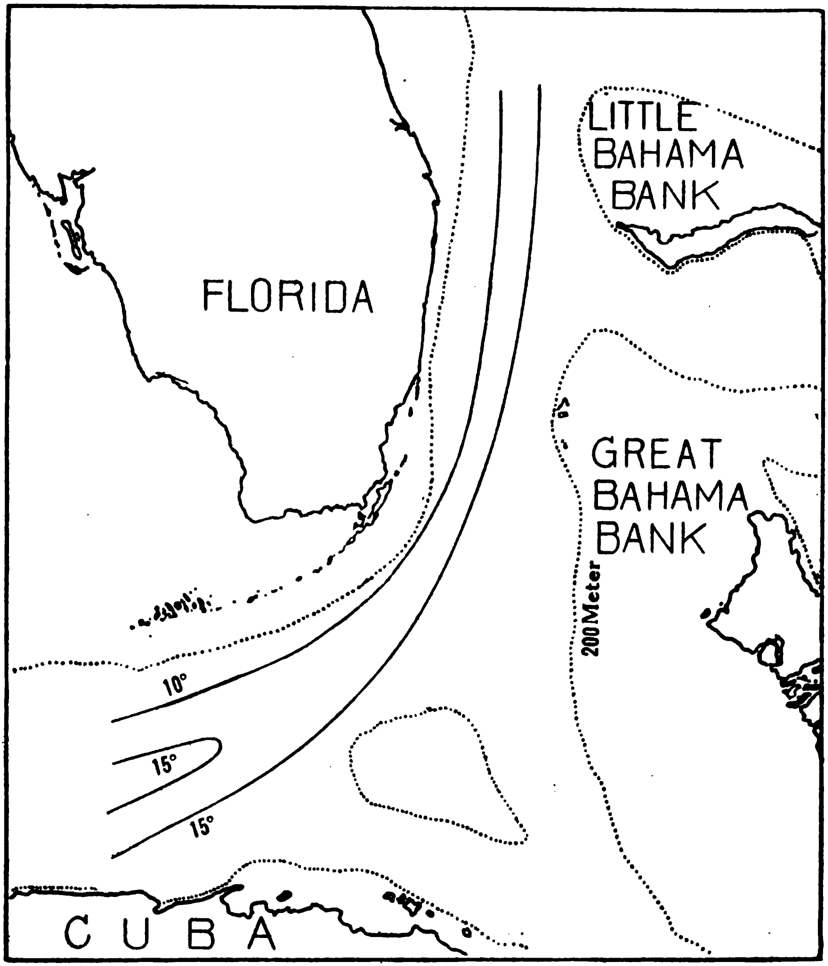

FIG. 37.—Temperature at 400 meters in the Straits of Florida, March, 1914.

The future must show whether the salinities outlined above are normal for the Straits, there being no reliable data for comparison; neither, for that matter, are the subsurface salinities known for any part of the Gulf of Mexico, the various hydrometer readings which have been taken there being too high (Krümmel, 1907, p. 357), nor for the water immediately north of the Bahamas. But the *Blake* temperature series taken in 1878 between the Tortugas and Cuba, and on the Cape Florida-Gun Cay line, reveal the same general dip of the temperature curves from north and west to south and east, and the same banking up of cold water against Florida that characterize the profiles run by the *Bache*.

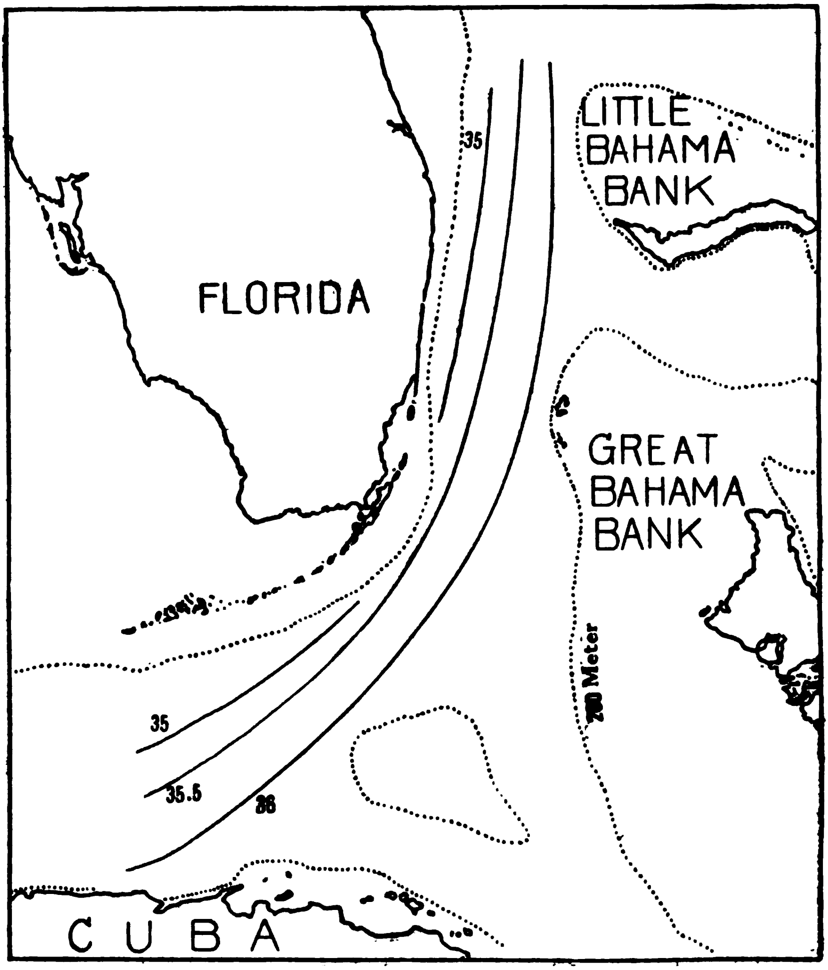

FIG. 38.—Salinity at 400 meters in the Straits of Florida, March, 1914.

At the western end of the Straits the temperatures for the two years agree very closely off Cuba (fig. 40) and on the Florida side (fig. 41), except that the immediate surface was warmer in May, 1878, than in March, 1914, as might have been expected from the difference in season. Otherwise the only notable deviation in the curves is that the 1,800-meter temperature was 5° higher in 1878 than in 1914, the water between 700 and 1,300 meters 1°-1.5° colder; and in the center of the channel (fig. 42) the water was considerably colder in the middepths in 1878, the warm band so notable in the *Bache* profile being absent. Consequently, the temperature curves in the *Blake* profile (Agassiz, 1888, p. 231, fig. 157) dip more regularly from north to south.

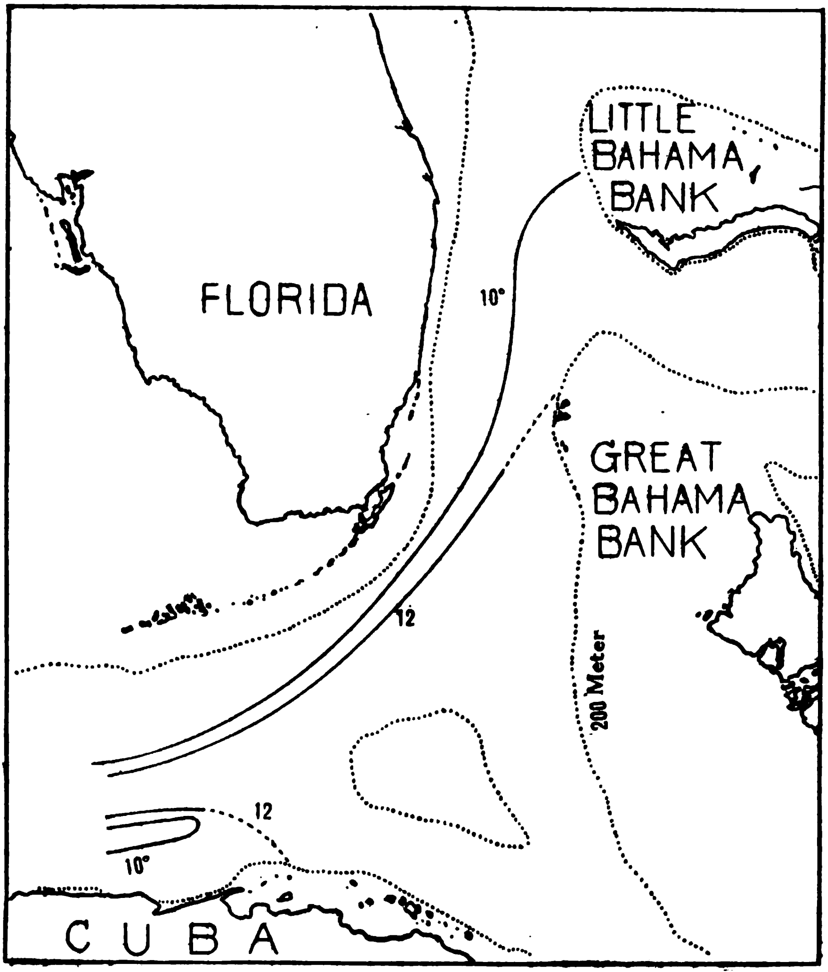

FIG. 39.—Temperature at 600 meters in the Straits of Florida, March, 1914.

The *Blake* profile (Agassiz, 1888) on the Cape Florida-Gun Cay line shows that water colder than 10° was much nearer the surface in 1878 than in 1914, although the temperature in the bottom of the channel was very nearly the same (5.5° to 6.1°) for the two years. Near the surface, however, the *Blake* temperatures taken in May were higher than the *Bache* readings in March, the temperature sec-

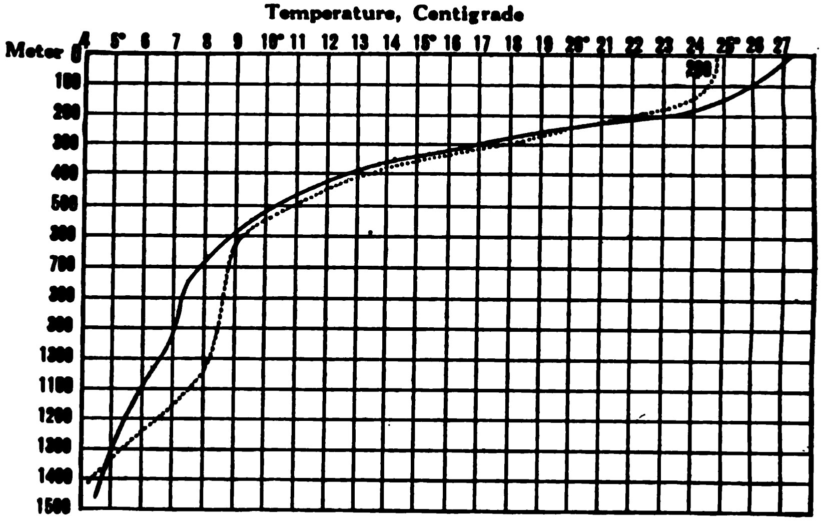

FIG. 40.—Temperature sections taken off Habana, Cuba, March, 1914, by the *Bache* (station 10200), (........), and off Port Muriel, Cuba, by the *Blake*, May 12, 1878 (_______).

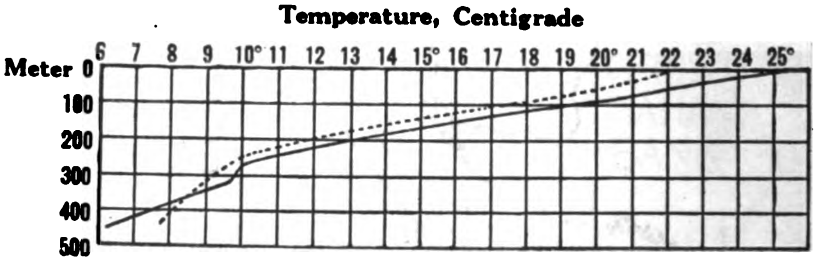

FIG. 41.—Temperature sections taken off Key West by the *Bache* (stations 10197, 10198), March, 1914, (.......), and off the Tortugas by the *Blake*, May 11, 1878 (_______).

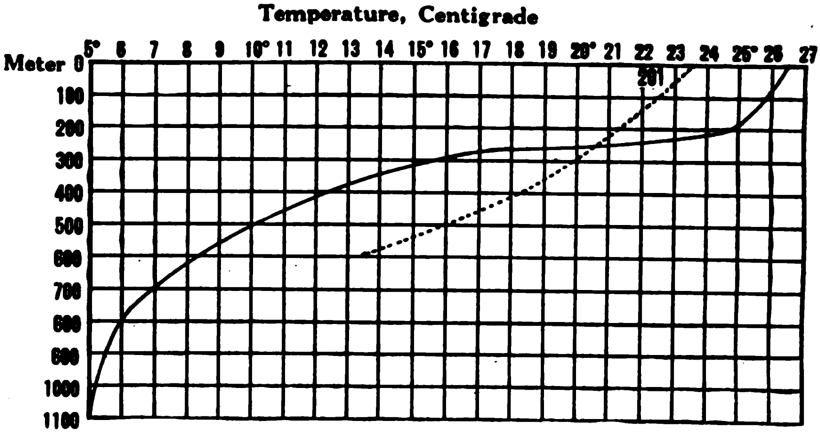

FIG. 42.—Temperature sections in the center of the Straits, between Florida and Cuba, by the *Bache* (station 10201), (........), and by the *Blake*, May 11, 1878 (_______).

tions showing that seasonal warming had progressed down to about 100 meters at that season.

The fact that cold water was banked up against Florida in both years is evidence that the general distribution of temperature encountered by the *Bache* is the normal condition for the Straits; but there are evidently considerable variations from year to year in the absolute temperature in the middepths, which probably depend on variations in the deep-water currents of the Straits.

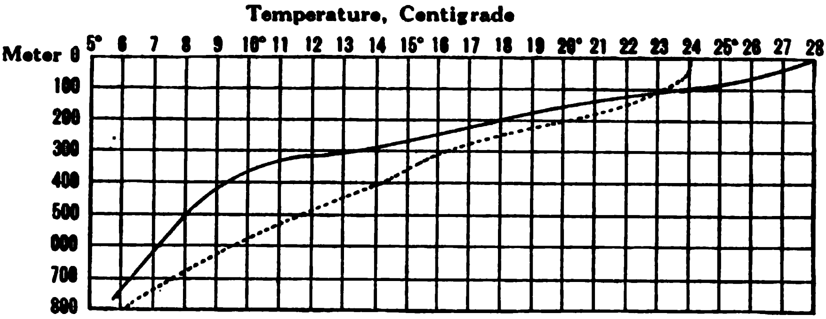

FIG. 43.—Temperature sections in the middle of the Straits between Gun Cay and Cape Florida, *Bache* (station 10203), ..., and by the *Blake*, May 30, 1878, ______.

It is, of course, common knowledge that a very strong surface current flows out of the Gulf of Mexico via the Straits of Florida,[a] but information as to the movements of the water in the deeper parts of the Straits is scanty. Mitchell (1869), it is true, believed that he found both velocity and direction constant down to 600 fathoms off the Cuban coast, and his conclusion was accepted by Alexander

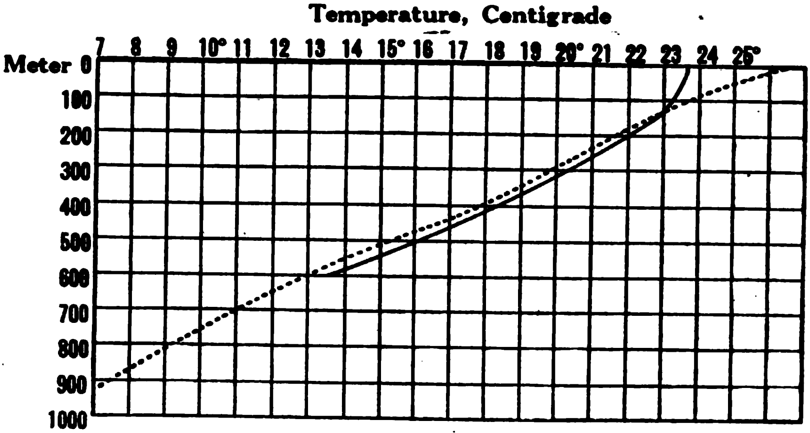

FIG. 44.—Temperature sections 40 miles northeast of Habana, March, 1914, *Bache* (station 10201), ______ and about 95 miles northwest of Habana, May 17, 1876 (*Blake*). ....

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[a] For an excellent summary of the history of the Gulf Stream, see Krümmel (1911), p. 574.

Agassiz (1888). The explorations by the United States Coast and Geodetic Survey (Pillsbury, 1886, 1887, 1889) show that an imperfect method of observation had much to do with this result, measurements with current meters at numerous stations demonstrating that as a whole the current was strongest on the surface, decreasing progressively with depth; and although it was still perceptible and sometimes as strong as the surface current at 130 fathoms (237 meters), the lowest level at which readings were regularly taken, the rate of decrease suggested comparative stagnation below about 250 fathoms (457 meters). Although the *Bache* made no actual current measurements, yet the difficulties encountered in using the oceanographic apparatus showed that the current ran very much more rapidly on the surface than in the middepths.

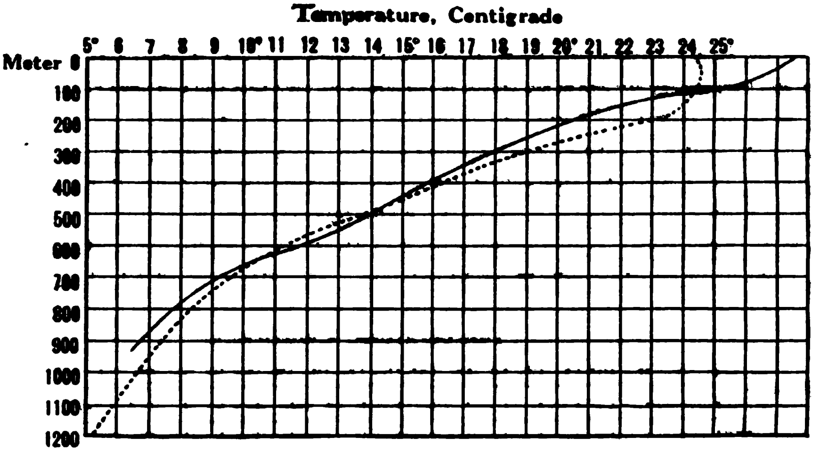

FIG. 45.—Temperature sections off Habana, March, 1914. *Bache* (station 10139), ..., and off Cape San Antonio, May 22, 1878 (*Blake*) (_______).

But densities show that the water can not be stagnant in the bottom of the channel, for water of 1.03 is higher at its exit than at its entrance, a state of instability which can only be maintained in one of two ways—i. e., either by a movement of abyssal water from the Gulf of Mexico up the slope of the channel, or by a cold bottom current from the Atlantic. The last supposition has nothing except the persistent and still popular tendency to credit all cool water along our coasts to the Labrador current [a] to support it. On the contrary, as Agassiz long ago pointed out, the fact that the general temperature of the Straits is the same as that of the mass of water west of it, but considerably lower than that of the Atlantic water into which it debouches, in itself seems to forbid the possibility that the cold water in the Straits of Florida comes from the north. A study of the *Blake* temperature sections on successive lines normal to the coast, from Cape Canaveral northward (Agassiz, 1888, fig. 176), shows that except on the immediate surface the Gulf Stream retains its character as a cool current as far as Cape Fear, beyond which it is indistinguishable from the water farther to the east. Furthermore, the evidence of salinity is, if anything, even more conclusive, because while the bottom water of the channel (34.8–34.9°/$_{00}$) is continuous with the abyssal water off Habana at its west end and hence of the Gulf, off the Bahamas water of this salinity was encountered only below 1,800 meters, a vertical drop of 1,000 meters from the exit of the channel. Hence, to suppose that the bottom water of the Straits enters from the Atlantic abyss, we must assume a vertical upwelling of 1,000 meters, of which there is no evidence whatever. And it can not be coastal water from the north, because far too salt. In short, it is clear that the bottom current in the Straits must flow in the same direction as the surface current—i. e., from the Gulf of Mexico—driving the heavy abyssal water of the latter (1.03+) up the slope, thus producing the density gradient mentioned above. This bottom current must be constant, or nearly so, since the rise of cold comparatively fresh water from the deeps of the Gulf up the rising floor of the Straits to near the surface at its exit is now shown to be a permanent phenomenon. In short, the countercurrents occasionally detected by Pillsbury on the bottom on the Florida side of the channel at about 100 fathoms, like the surface countercurrents so long recognized by mariners, are merely local reaction phenomena, or eddies. However, the velocity of the bottom current is certainly only a fraction of the surface drift; and it may be very small indeed.

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[a] Sumner (1913); Soley (1911).

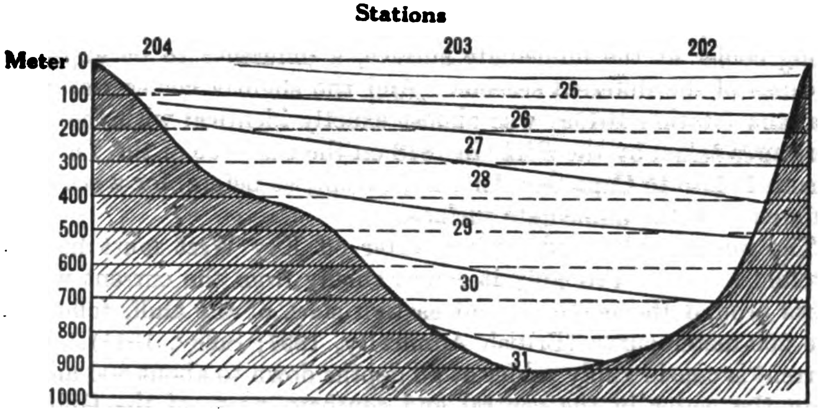

Fig. 46.—Profile of density, at temperature *in situ* and corrected for pressure, across the Straits of Florida, Gun Cay to Cape Florida.

The close agreement between the salinity of the bottom of the Straits and that of the water in the Atlantic abyss is not the least interesting discovery made by the *Bache*, for it shows that the salinity of the water which flows into the Caribbean Sea through the bottom of the Windward Passage (between Cuba and Haiti), the Anegada Passage (between Sombrero and the Virgin Islands), and possibly the passages between Dominica, Martinique, St. Lucia, and St. Vincent, and thence into the Gulf of Mexico via the bottom of the Yucatan Channel, is unaltered during its sojourn there, a generalization which also holds for temperature, as pointed out by A. Agassiz (1888, p. 220).

The vertical distribution of temperature in the upper layers on the southern half of the Key West–Habana line is generally similar to that of the southwestern part of the Gulf and Straits of Yucatan. In spite of the interval of 40 years between the two sets of observations, the temperature at *Bache* station 10021 agrees almost exactly, down to 800 meters, with the temperature encountered by the *Blake* on May 17, 1876, about 95 miles northwest of Habana, except for being cooler at the immediate surface, a difference to be expected because of the different seasons. And the slightly cooler water off Habana (station 10199) was almost exactly identical with the temperatures taken by the *Blake* in 1878 on the east side of the Yucatan Channel close to Cape San Antonio, except, as before, for a seasonal difference on the immediate surface.

The much colder and fresher water off Key West must have a twofold origin. Probably it comes chiefly from the current which flows around the northern and eastern sides of the Gulf, following the 200-meter curve (British Admiralty, 1897; Soley, 1911). This current is considerably colder at all depths down to about 800 meters than the water in the central and southern parts of the Gulf, as shown by temperatures taken off Apalachicola, Fla., by the United States Fish Commission steamer *Albatross*[a] on March 13, 1885, receiving its low temperature from the cold water in the northwestern part of the Gulf (Krümmel, 1907). The water is even colder on the surface at this season along the north shore of the Gulf than in the Straits. However, this cold surface is confined to a very narrow belt (Deutsche *Seewahrte*, 1882) and is probably due to the cold "northers" which blow so often in winter.

The fact that, except for this shallow surface layer, the water was considerably colder close to Key West than the *Albatross* found it in the northern part of the Gulf (fig. 26), indicates that some upwelling was taking place from the deeps of the Gulf. Thus, temperatures suggest that the west end of the Straits is a condensed epitome of the Gulf as a whole, water from the north flowing around the Florida cays, from the center of the Gulf into the center of the

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[a] Dredging and other records of the United States Fish Commission steamer *Albatross*, etc.; Townsend, C. H.; Report United States Commission of Fish and Fisheries, 1900, p. 494.

Straits, and from the southern part of the Gulf along the shore of Cuba, into the southern side of the Straits, as into a funnel. Upwelling of bottom water against the coast of Florida grows more pronounced as this tremendous mass of water forces its way farther and farther into the ever narrowing and shoaling channel.

The unity of temperature between the western end of the Straits in 1914, and the Gulf of Mexico as a whole in 1878, is further interesting because it shows that the difference of temperature in the eastern end of the Straits in the two years can not have been due to any intrinsic difference in the reservoir from which the water came, but must have been the result of a greater flow of cold bottom water in 1878 than in 1914. For all that is yet known, this may be a seasonal, not a vicarious or periodic, variation.

The banking up of cold water against Florida is usually classed as the effect of the rotation of the earth, forcing the water out of its course toward the right against Cuba and the Bahama Bank, with consequent upwelling from the deep layers on the left-hand side of the channel, according to Ekman's (1905) theory (Krümmel, 1911, p. 459). The discovery that the cold comparatively fresh water next to Florida is largely true abyssal water from the Gulf of Mexico supports this view. The density profile, Cape Florida to Gun Cay (fig. 46), shows how much lighter, as well as fresher and colder, the water was on the left than on the right side of the current,[a] an illustration of how effective the deflective force of the earth's rotation is in establishing the distribution of temperature and salinity in a current as rapid as the Florida stream.

THE COAST WATER OFF CHESAPEAKE BAY.

Exploration of the coast water was only incidental to the main work of the *Bache*, but stations 10157–10160 off the mouth of Chesapeake Bay, and a series of observations taken on the continental shelf in that same general region in January, 1916 (p. 60), by the Bureau of Fisheries steamer *Roosevelt*, may be discussed here because of their bearing on the general problem of the origin of the coast water and its relationship to the Gulf Stream (Bigelow, 1915, p. 250).

In January, 1913 (*Bache* stations), the temperature from the coast out to the 35-meter contour was between 6° and 7°, practically uniform from surface to bottom. The salinity, however, showed considerable vertical range even in the small depth of 18 meters (30.01°/₀₀ on the surface, 33.57°/₀₀ on the bottom, station 10157), and at the 35-meter contour the freshest water lay at 20 meters (station 10159), with salter water both above and below (fig. 48), instead of on the surface. Over the 200-meter contour, always an important zone off the United States coast because of the abrupt change in the slope of the bottom at this level, the temperature was highest at the middepth (station 10160, 100 meters, 12°), with 9° both on the surface and on the bottom, the latter several degrees warmer than the bottom temperature near the coast, in spite of the greater depth (fig. 47). The salinity (fig. 48) also was considerably higher, with a rapid vertical increase from the surface downward to 35.37°/$_{oo}$ on the bottom. Over the 1,800-meter contour, a few miles outside the continental shelf (station 10158, fig. 47), the water was warmer, depth for depth, being nearly uniform at 11°–12° down to 300 meters, below which level there was a rapid cooling to about 5° at 700 meters, followed by a slow decrease of temperature to 3.55° at 1,800 meters. However, there was no water at this station (fig. 23) as salt as the bottom water over the outer edge of the shelf, the highest salinity being only about 35.19°/$_{oo}$ at 300 meters, with a slow decrease below this level. Near the surface the course of the salinity section is noteworthy, the water being freshest at 20 meters, not on the surface. Eighty-five miles farther offshore (station

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[a] For discussion of the general problem of the effect of the earth's rotation on ocean currents, see Ekman (1905) and McEwen (1912). For an excellent summary of the results on actual ocean currents, see Murray and Hjort (1912), p. 276.

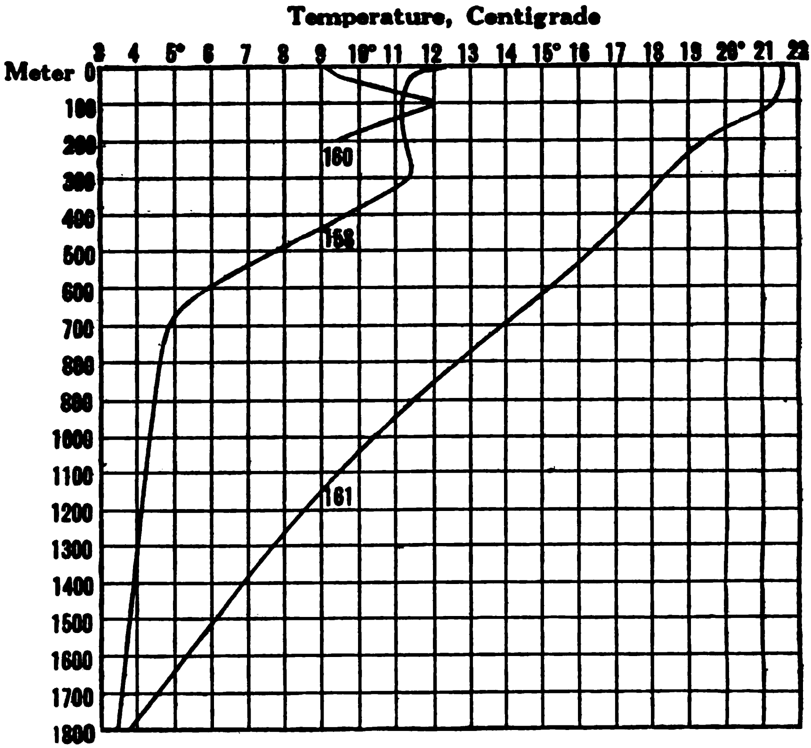

FIG. 47.—Temperature sections off the mouth of Chesapeake Bay, stations 10158, 10160, 10161.

10161) the water was much warmer and salter in the upper layers (maximum temperature 21.5°, salinity about 36.45°/₀₀), with a steady decline with depth, the temperature at 1,800 meters being practically the same as at station 10158. Unfortunately, no water sample was taken at that level. The density (corrected for pressure by Ekman's tables of 1910) was lowest at the surface at all these stations, greatest at the bottom (p. 60).

The general temperature profile (fig. 11) shows that at this time the coast water over the shelf and on the continental slope was much colder than the oceanic water farther east at corresponding depths, the transition from one to the other being so sudden that the temperature curves dip very steeply from land to sea, a typical "cold wall." For example, the 5° curve rises from about 1,000 meters at station 10161 to about 500 meters on the slope in a horizontal distance of 100 miles, and the uniform bottom water of the abyss (4°, and about 35°/₀₀) from about 1,800 meters over the oceanic basin to about 1,200 meters on the slope in the same distance. But the cold coast water (about 6°) was not continuous with the cold water of the abyss, being separated from it by a band of warmer water (9°-10°) washing the bottom at the 200-meter level, and the curves suggest that the bottom water was even warmer (10°-11°) at about 250 meters.

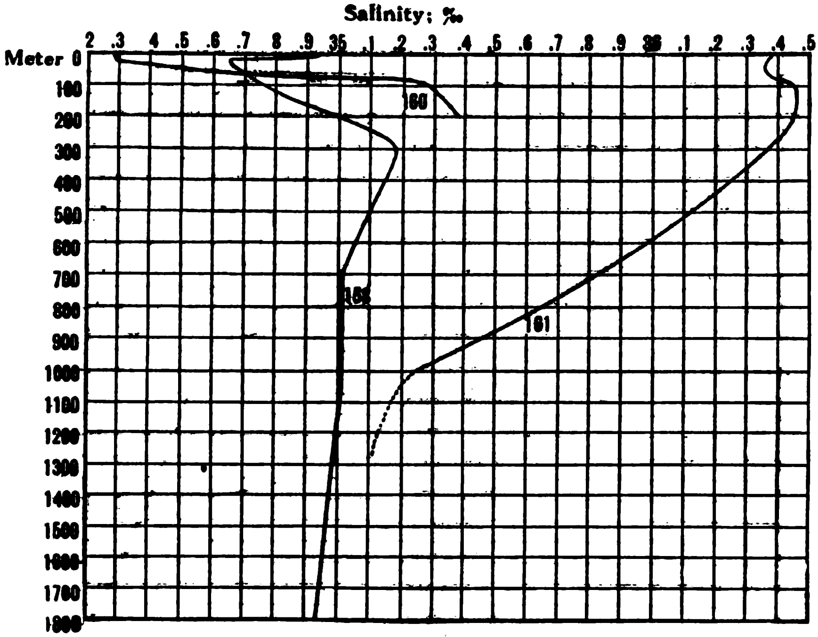

FIG. 48.—Salinity sections off the mouth of Chesapeake Bay; stations 10158, 10160, 10161.

The temperatures over the inner part of the shelf, both vertical and horizontal, were extremely uniform.

Except for its demonstration that the cold coast and abyss waters were discontinuous, the temperature profile does not throw much light on the movements of the water in this region; but the salinity profile (fig. 49) is unusually instructive in this respect. In general, salinity, like temperature, was much lower near the coast than over the oceanic basin, with the same sudden transition from one type of water to the other. The distinction is even sharper in salinity than in temperature, the coast water (33–35°/₀₀) being separated by a zone of much salter water some 1,000 meters thick from the abyssal water (34.9–35°/₀₀). On the shelf itself there was a steady rise of salinity from the land out to about the 100-meter contour, the curves for successive salinities showing that the axis of freshest water dipped from the surface next the land to about 30 meters at station 10160, overlying considerably salter bottom water. It is over the 200-meter contour that the profile is most instructive, for here water fresher than 35°/₀₀ suddenly dips downward like a tongue into the salter ocean water, and the bottom water of about 35.37°/₀₀ at station 10260 seems to have been entirely surrounded by fresher water.

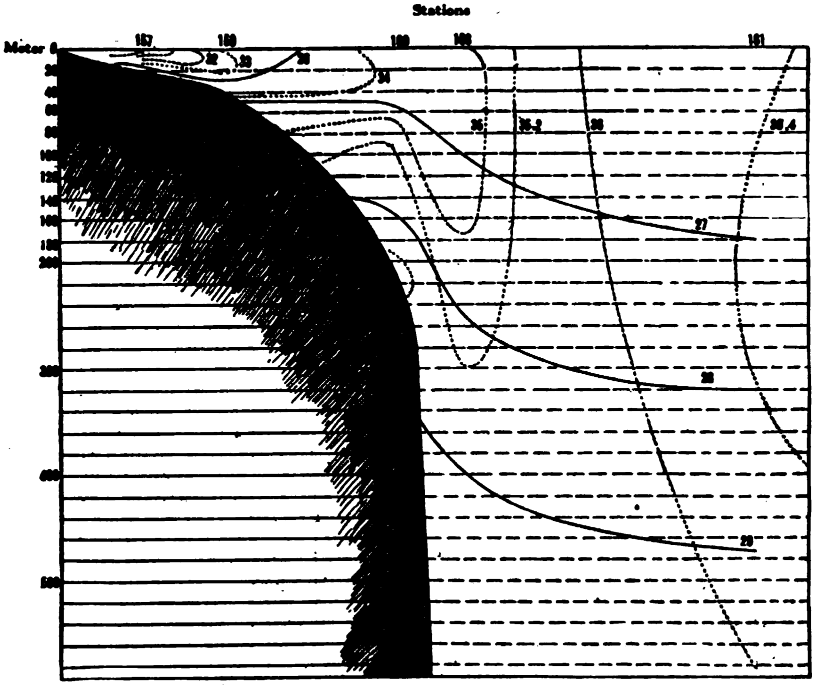

FIG. 49.—Profile of salinity, ..., and density at the temperature *in situ*, ______, from the mouth of Chesapeake Bay, across the continental shelf, to a point 90 miles southeast of the 200 meter contour.

Such a distribution of salinity obviously suggests that water was flowing down off the shelf into the ocean deeps, and densities are entirely in harmony with this explanation. Thus the water was decidedly denser—i. e., heavier—over the slope (stations 10258, 10260) than at corresponding depths either on the shelf (stations 10157, 10159, p. 59) or in the ocean basin to the east (station 10161, p. 59); hence, would naturally tend to sink. This is further illustrated by the profile (fig. 49), on which all the density curves from the surface down to 500 meters dip sharply toward the ocean basin over the 200-meter contour, and their gradient of about 100 meters in a distance of only 40 miles is steep enough to indicate a very potent dynamic cause for vertical circulation of this type. True, while such a distribution of density suggests a downpour, it does not prove it, because more or less similar densities might result from the opposite process—i. e., an upwelling of heavy water from the abyss over the slope. But when we add the facts that this dense water exactly coincides with the fresh tongue just described, and that the tongue is absolutely separated from the abyss by considerably salter water in the middepths, there is no escape from the conclusion that a downpour or waterfall was actually taking place. If any further confirmation be needed, it is supplied by the fact that the temperature of the axis of this tongue of 34.5–35°/₀₀ water (station 10158) was almost uniform (11°–12°) from the surface down to 300 meters—i. e., to almost exactly the depth to which the curve for 35.2°/₀₀ salinity dips—below which there was a rapid cooling to the considerably lower temperatures (4°–5°) of the abyss. Had upwelling been active, just the reverse—i. e., a sudden vertical cooling in the upper layers—would have obtained.

The sudden cooling (fig. 47) and the reversal of the vertical change in salinity (fig. 48) at 300–700 meters over the slope (station 10158) marks this zone as the lower limit to the downward flow. The uniform abyssal temperature (about 4°) and salinity (about 34.9–35°/₀₀) was encountered here at about 1,200 meters; but in the ocean basin to the east, and, indeed, along the whole line to Bermuda, the upper limit to this abyssal water was at about 1,800 meters (p. 16, fig. 11, 12). So uniform is this water over the north Atlantic as a whole (Krümmel, 1907), and so closely do the curves for 35°/₀₀ and 4° coincide, that this difference in level is only explicable as the result of upwelling over the lower part of the continental slope, the first time we have actually been able to demonstrate this type of circulation on any large scale off our coast (1915). So far as true abyssal water is concerned, this updraught did not rise above about 1,000 meters; but the close agreement between the salinity and temperature of the bottom water on the slope (station 10160) and of the water of the midzone at 1,300–1,400 meters to the east (stations 10161, 10163, 10166) suggests that the latter also was involved, moving up the slope to within about 200 fathoms of the surface. All this, of course, suggests that upwelling from the middepths may play a rôle of some importance in the maufacture of the zone of mixed water along the continental slope, though there is no evidence that oceanic upwelling ever reaches the continental shelf, as Petterson (1897), Clark (1914), and others have supposed. But while there may have been an updraught over the slope shortly previous to the cruise of the *Bache*, nothing of the sort was taking place at that time, because the bottom water at station 10260 was then entirely cut off from the equally salt midlayers by the lower salinities at station 10258 (p. 48).

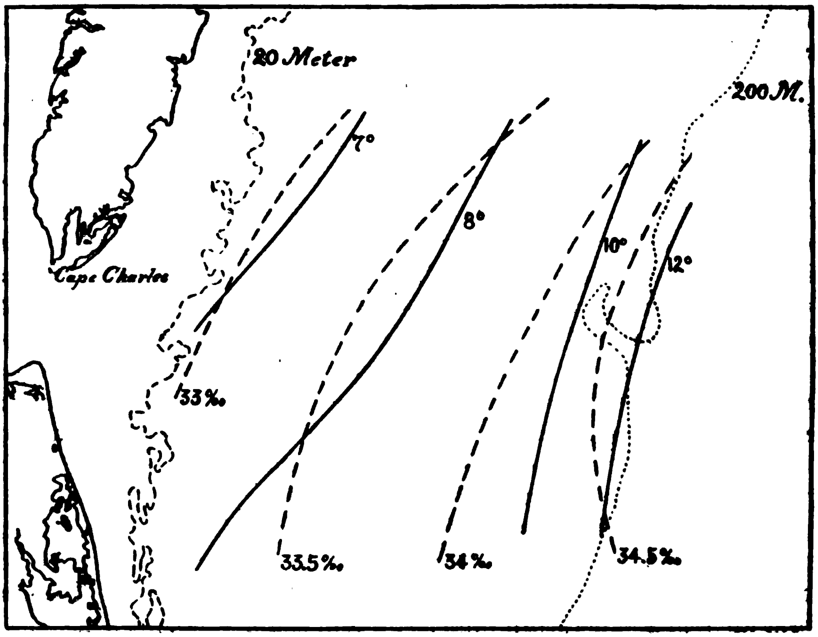

FIG. 50.—Temperatures, ———, and salinities, - - - -, off Chesapeake Bay at 20 meters, January, 1916 (*Roosevelt* stations).

A simple explanation for the fact that the descending tongue did not actually follow the slope, but was separated from it by a layer of salter, cooler water, is that the latter is merely a contrast phenomenon, the water preexisting along this part of the slope cut off by the downpour. The single *Bache* profile, unfortunately, is not sufficient to clear up this question. The existence of the downpour and of upwelling below 1,000 meters, however, is amply demonstrated.

The more complete survey of the shelf abreast of Chesapeake Bay carried out by the *Roosevelt* in 1916 (p. 45, 60) shows that the temperature was as uniform vertically in January, 1916, as in the corresponding month of 1914, the greatest vertical range at any station inside the 100-meter contour being only about 2° (p. 60), and that the temperature rose, passing offshore, from about 6°–7° near the land to 10°–12° over the continental slope, just as in 1914 (fig. 50); but the coast water as a whole was 1°–2° warmer at corresponding localities and depths in 1916 than in 1914.[a] Unfortunately the *Roosevelt* lines did not run offshore far enough to meet the warm "Gulf Stream" water.

The salinities for the two years likewise agree, in so far as they rise from the land seaward (fig. 50), and in the flooding of the surface next to the land with water fresher than 30°/₀₀. But in 1916 the water over the shelf between the 20 and 100 meter contours was practically uniform from surface to bottom, and the coast water as a whole was slightly salter than in 1914.

A difference far more important, if anything more than apparent, is that the profiles for 1916 (fig. 51, 52) do not show anything comparable to the downpour outside the slope, so unmistakable in 1914; but it is possible that something of the sort would have appeared, had the profiles run far enough offshore to reach the warm ocean water, for the curves for 35°/₀₀ and 35.2°/₀₀ salinity strongly suggest the corresponding values for 1914 (fig. 49), so far as they go. Assuming the density of the ocean water to have been about the same in 1916 as in 1914, which was probably the case, there would have been the same dynamic tendency for the water over the slope to sink, in 1916 as in 1914, because the density was practically the same, at corresponding locations on the slope, for the *Roosevelt* as for the *Bache* stations (p. 59, 60). There is nothing in temperature to forbid it; on the contrary, the fact that water colder than 10° projected seaward from the shelf into the warmer water offshore in 1916 (fig. 51) distinctly indicates a seaward flow at about the 50-meter level; and the temperature curves over the slope for the two years are readily reconciled with each other on the assumption that the seaward flow over the outer part of the shelf was localized in the upper 30 meters in 1914, as indeed salinity demands, whereas in 1916 it was rather deeper. In 1916 the slope, at 150–250 meters, was washed by water of 12°, a typical warm belt of the sort we are familiar with further north in summer (Bigelow, 1915), whereas in 1914 there was no bottom water warmer than 10° along this line. But as winter cooling seems to have progressed further by the end of January in 1914 than in 1916, this difference is, to all intents and purposes, a seasonal one.

The salinity of the downward flowing tongue of January, 1914 (34–34.5°/₀₀), together with its comparatively low temperature, identifies it as the mixed water resulting from the contact of ocean with coast water. This contact, as is well known, takes place all along the continental slope as far north as the Grand Banks of New

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[a] The minimum temperature was lower in 1916 (station 8451, 5.8°) than in 1913 (station 10157, 6.2°); but this difference may be due to different geographic locations.

Foundland. But whether the water thus manufactured tends to sink, or float, depends on the density resulting from the precise temperature and salinity at any given locality, compared to that of the upper 300 meters or so in the warmer, but salter, water east of it. And, unfortunately, the relative densities of the two, off our coasts, are only known off Chesapeake Bay, and along a profile some 40 miles east of Cape Cod, run by the *Grampus* in July, 1914, none of our other profiles across the slope having reached the undiluted ocean water. The density of the mixed water, however, is fairly well known for the summer season from Chesapeake Bay to Nova Scotia (Bigelow, 1915). But comparison between the two waters may fairly be extended beyond these actual records, for it is safe to assume that

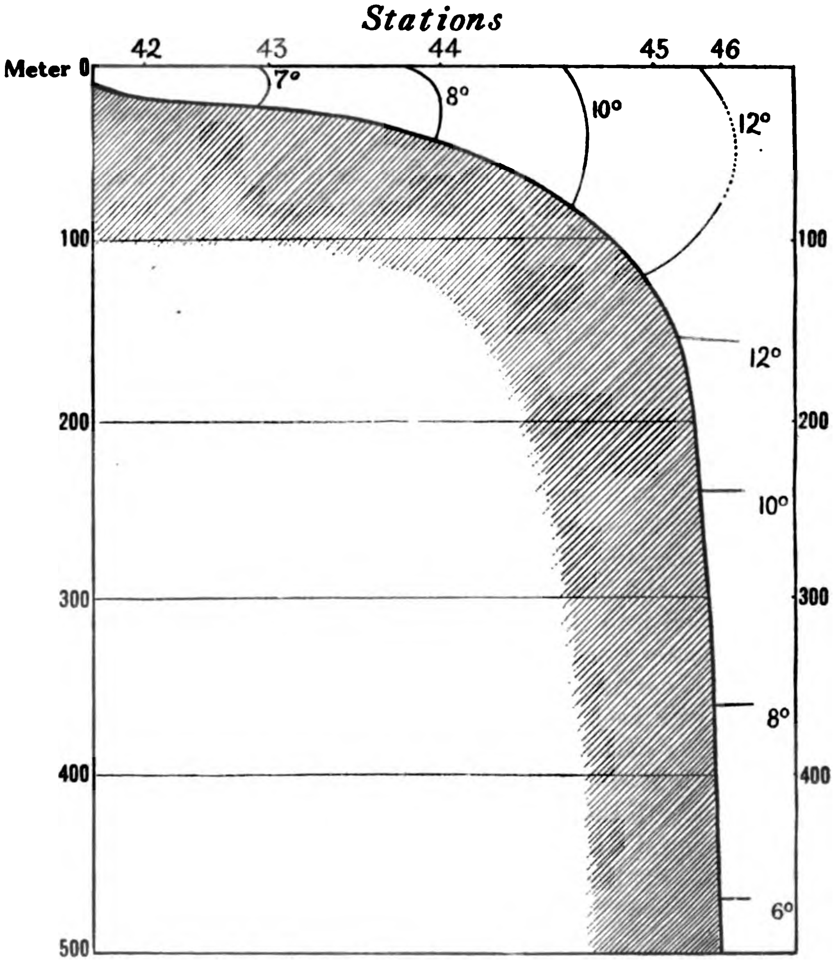

FIG. 51.—Temperature profile across the continental shelf off Chesapeake Bay, January, 1916 (*Roosevelt* stations 8442, 8443, 8444, 8445, 8446).

the ocean density at any given latitude is at least no higher in summer than in winter; probably lower, because of solar warming, there being no reason to expect any great change in salinity outside the zone influenced by the coast. If this be true, there is the same dynamic tendency for the mixed water at the 50–150 meter level, over the slope off Chesapeake Bay, to sink in summer as in winter, because the densities are practically the same there for the two seasons (*Bache* station 10158; *Grampus* station 10176, Bigelow, 1915, p. 345) except on the immediate surface, where the water was so light in summer that it must have been floating out over the ocean water offshore (Bigelow, 1915). And summer densities were almost precisely the same, at the same relative position, off Delaware Bay (Bigelow, 1915, station 10171) as off Chesapeake Bay, in 1913 (fig. 53).

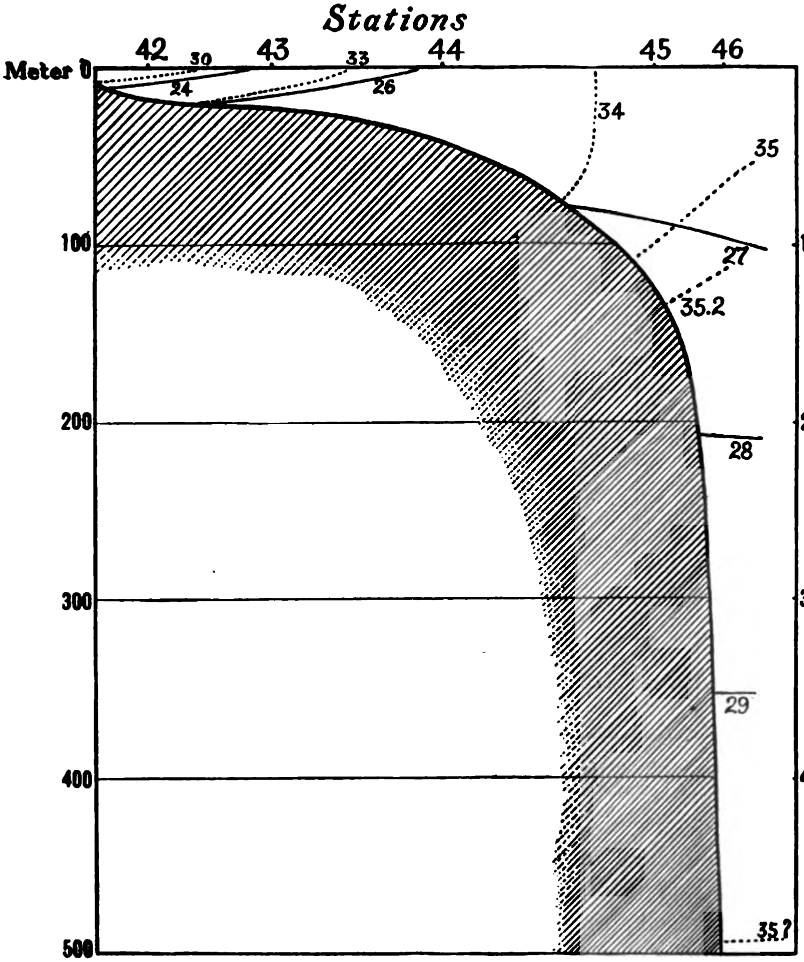

FIG. 52.—Salinity profile across the continental shelf off Chesapeake Bay, January, 1916 (*Roosevelt* stations 8442, 8443, 8444, 8445, 8446).

Only off Chesapeake Bay is the actual density of the mixed water known for winter. But inasmuch as winter cooling, off our coasts, is most rapid and most extreme next the land (Bigelow, 1915), while the salinity of the coast water, so far as known, rises during autumn and winter (Bigelow, 1915), it follows that the mixed is heavier than ocean water in winter all along our coast, as it certainly is off Chesapeake Bay (p. 49).

But while the actual occurrence of a downpour over the slope can be considered as demonstrated off Chesapeake Bay in winter, and off Georges Bank in summer, our summer profiles across the shelf at intermediate points would be hard to reconcile with this type of vertical circulation (Bigelow, 1915). It is possible that a local dynamic tendency of this sort might be overridden by some more wide-spread type of oceanic circulation. But whether the downpour be general for the zone over the continental slope, or only local or temporary, the fact that it actually occurs is one of the most interesting hydrographic results of the cruise of the *Bache*, for whenever anything of the sort takes place the mixed water must play as important a rôle in the manufacture of the deeper layers of the coast water on the shelf as it does in the Gulf of Maine.

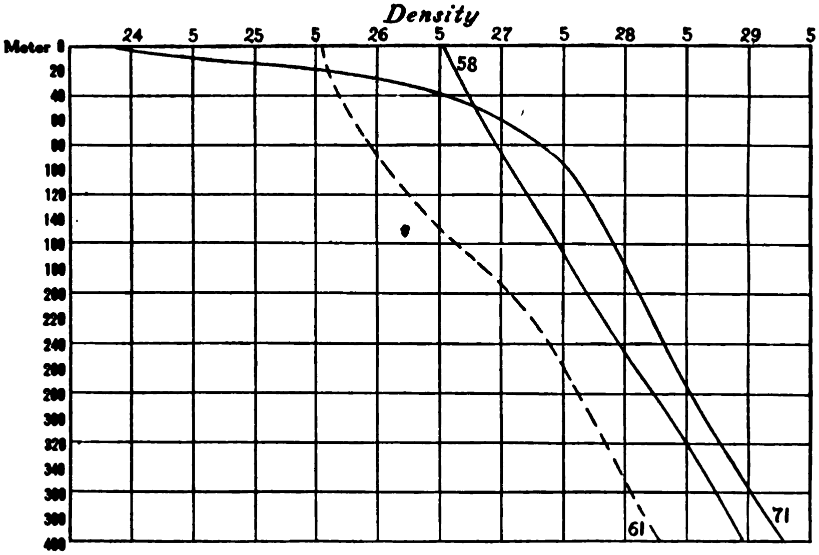

FIG. 53.—Density sections in the ocean water (*Bache* station 10161), and in the mixed water (*Bache* station 10158), off Chesapeake Bay, January, 1914, and in the mixed water (*Grampus* station 10171), off Delaware Bay, July, 1913.

Finally, it is shown that there is nothing in the *Bache* or *Roosevelt* temperatures to suggest the "Arctic" current so often invoked off our coasts (Bigelow, 1915), the coast water being far too warm even in January.

TABLE OF SALINITIES AND TEMPERATURES; "BACHE" STATIONS, 1914.

Date.	Station.	Lat. N.		Long. W.		Depth.	Salinity.	Temperature.
		°	'	°	'	*Meters.*	‰	° *C.*
Jan. 20	10157	36	46	75	38	0	30.01	6.20
						18	33.57	6.75
Jan. 21	10158	36	12	74	25	0	34.94	12.30
						20	34.67	11.45
						100	34.76	11.15
						300	35.19	11.40
						700	35.01	4.78
						1,100	35.01	4.20
						1,800	34.94	3.55
Jan. 26	10159	36	35	75	20	0	33.04	7.00
						20	32.95	6.85
						36	33.22	6.75
Jan. 26–27	10160	36	12	74	41	0	34.29	9.15
						20	34.29	9.40
						100	35.28	12.00
						200	35.37?	9.45
Jan. 27	10160½	....	....	....	....	0	36.08	22.20
Jan. 28	10161	35	27	73	14	0	36.38	21.50
						20	36.35	21.50
						100	36.44	21.35
						200	36.44	19.60
						600	35.99	15.20
						1,000	35.25	10.40
						1,800	....	3.70
Jan. 29	10162	34	41	73	23	0	36.44	19.30
	10162½	34	03	73	30	0	36.49	18.80
	10163	33	22	73	37	0	36.49	18.95
						20	36.53	18.90
						100	36.44	18.85
						200	36.49	18.90
						600	36.08	15.70
						1,000	35.41	10.05
						1,800	34.97	3.80
Jan. 30	10163½	33	02	73	38	0	36.44	19.90
	10164	32	29	73	28	0	36.56	20.70
	10165	32	32	72	55	0	36.53	20.40
	10166	32	33	72	14	0	36.45	19.15
						20	36.47	19.20
						100	36.45	18.80
						200	36.42	18.30
						600	36.08	15.80
						1,000	....	10.00
						1,800	....	4.05
Jan. 31	10167	32	31	71	53	0	36.49	19.30
	10168	32	28	71	41	0	36.53	19.10
Jan. 31–Feb. 1	10169	32	29	71	29	0	36.44	18.95
						20	36.38	19.00
						100	36.44	18.85
						200	36.42	18.83
						600	36.26	15.60
						1,000	....	10.50
						1,800	35.01	....
Feb. 2	10170	32	18	71	12	0	36.40	18.90
	10171	32	27	69	55	0	36.45	18.95
						20	36.44	19.03
						100	36.45	18.84
						200	36.44	18.65
						600	36.08	16.10
						1,000	35.71	6.70
						1,800	34.99	4.00
Feb. 3	10172	32	26	69	21	0	36.45	18.90
Feb. 4	10173	32	27	68	22	0	36.44	18.85
						20	36.44	18.90
						100	36.42	18.70
						200	36.44	18.10
						600	36.17	16.50
						800	35.64	13.10
						1,000	....	11.60
						1,400	35.46	5.55
						1,800	34.96	3.90
						3,650	....	....
						4,570	34.87	....
Feb. 5	10174	32	28	67	41	0	36.44	18.90
	10175	32	28	66	28	0	36.38	18.90
						20	36.38	18.90
						100	36.36	18.90
						200	36.45	18.90
						600	36.17	16.30
						1,000	....	....
						1,800	....	4.20
	10176	32	30	65	48	0	36.44	19.20

TABLE OF SALINITIES AND TEMPERATURES; "BACHE" STATIONS, 1914—Continued.

Date.	Station.	Lat. N.		Long. W.		Depth.	Salinity.	Temperature.
		°	'	°	'	*Meters.*	°/₀₀	° *C.*
Feb. 6	10177	32	32	65	12	0	36.42	19.10
						20	36.40	18.95
						100	36.44	18.96
						200	36.42	18.97
						400	36.35	17.40
						600	36.00	15.50
						1,000	....	....
						1,200	35.06	11.55
						1,500	....	4.35
						1,800	34.99	3.60
Feb. 17-18	10178	32	20	64	21	0	36.42	18.80
Feb. 18	10179	32	12	64	42	0	36.40	18.64
						20	36.44	18.40
						100	36.44	18.50
						200	36.42	18.52
						400	36.31	17.15
						600	35.90	14.52
						800	35.77	13.74
						1,000	35.37	9.65
						1,800	34.99	4.40
Feb. 18-19	10180	31	52	65	14	0	....	18.10
Feb. 19	10181	31	01	65	58	0	36.42	19.37
						20	....	19.28
						100	36.42	18.78
						200	36.44	18.89
						400	36.33	17.13
						600	35.93	15.20
						800	35.37	....
						1,000	35.07	7.38
						1,200	35.03	....
						1,400	....	4.88
						1,500	....	....
						1,800	35.01	3.89
Feb. 19-20	10182	30	27	66	05	0	36.56	20.12
Feb. 20	10183	29	32	66	25	0	36.62	21.00
						20	....	19.97
						100	36.62	20.89
						200	36.53	19.22
						400	....	17.41
						600	36.17	16.31
						800	35.73	13.68
						1,000	....	7.67
						1,400	....	5.52
						1,500	....	....
						1,800	....	4.39
Feb. 21	10184	29	17	67	07	0	36.56	20.07
	10185	29	16	67	51	0	36.42	19.80
						20	....	19.89
						100	36.49	19.55
						300	36.35	17.30
						600	35.79	14.40
						800	35.21	9.67
						1,000	35.10	....
						1,200	....	....
						1,400	....	4.44
						1,800	35.01	3.77
Feb. 21-22	10186	29	15	68	35	0	36.47	19.40
Feb. 23	10187	28	59	69	22	0	36.51	19.30
						20	....	19.23
						100	36.49	19.26
						300	36.47	....
						600	36.24	16.44
						800	35.70	13.05
						1,000	35.19	9.05
						1,200	35.05	....
						1,400	34.99	5.08
						1,800	34.99	4.01
Feb. 24	10188	28	51	70	08	0	36.47	19.47
	10189	28	48	70	40	0	36.47	19.66
						20	....	19.63
						100	36.45	20.83
						300	36.45	17.95
						600	36.13	16.18
						800	35.55	....
						1,000	35.08	8.37
						1,200	34.99	....
						1,400	34.99	5.00
						1,800	34.97	4.10

TABLE OF SALINITIES AND TEMPERATURES; "BACHE" STATIONS, 1914—Continued.

Date.	Station.	Lat. N.	Long. W.	Depth.	Salinity.	Temperature.
		° '	° '	*Meters.*	°/oo	° *C.*
Feb. 25	10190	28 42	71 32	0	36.56	20.10
	10191	28 33	72 24	0	36.56	21.42
				20	....	21.39
				100	36.60	18.20
				300	36.33	17.70
				600	35.95	15.11
				800	35.35	11.11
				1,000	35.03	....
				1,200	35.07	5.53
				1,400	....	4.70
				1,800	34.96	3.79
Feb. 26	10192	28 35	73 33	0	36.62	21.58
				4,528	35.03	....
				4,733	35.03	....
Feb. 27	10193	28 43	74 22	0	36.53	21.75
				20	....	21.73
				100	36.53	19.88
				300	36.53	18.01
				600	35.93	14.67
				800	35.19	....
				1,000	35.03	10.05
				1,200	35.06	5.35
				1,400	....	4.54
				1,800	35.01	3.74
Feb. 28	10194	28 51	75 13	0	36.53	21.55
	10195	29	76 23	0	36.49	21.70
				20	....	21.70
				100	36.51	21.38
				300	36.47	17.90
				600	35.82	14.07
				800	35.21	9.87
				1,000	35.03	....
				1,200	35.01	....
				1,400	34.97	4.37
				1,800	34.99	3.74
Mar. 3	10196	25 27	77 16	0	36.58	22.83
				20	....	22.84
				100	36.56	22.82
				500	35.64	12.93
				1,000	35.03	5.20
				3,400	34.92	2.86
Mar. 13	10197	24 18	81 50	0	36.06	20.78
				20	36.02	20.89
				60	36.08	20.59
				100	36.00	15.56
				150	35.66	13.39
				200	35.30	11.03
	10198	23 59	81 50	0	36.11	23.35
				20	36.11	23.06
				100	....	20.34
				200	....	13.98
				400	....	10.36
				900	34.90	7.00
Mar. 14	10199	23 13	81 50	0	35.97	24.34
				20	36.00	24.60
				100	36.06	....
				200	36.53	23.31
				400	36.17	15.93
				600	35.28	11.24
				1,200	34.92	5.03
Mar. 18	10200	23 32	81 48	0	35.93	24.78
				20	35.93	24.72
				100	36.26	24.45
				200	36.58	22.34
				400	35.66	13.51
				600	35.03	9.10
				1,000	34.87	8.31
				1,400	....	4.36
Mar. 19	10201	23 47	81 47	0	36.08	23.61
				400	....	18.37
				600	....	13.45
				1,700	34.94	....
	10202	25 34	79 24	0	36.17	23.35
				20	....	23.30
				100	36.26	23.23
				200	36.67	21.82
				300	36.44	18.71
				400	36.26	16.63
				500	35.81	14.15
				700	35.53	12.17

TABLE OF SALINITIES AND TEMPERATURES; "BACHE" STATIONS, 1914—Continued.

Date.	Station.	Lat. N.		Long. W.		Depth.	Salinity.	Temperature.
		°	'	°	'	*Meters.*	°/oo	° *C.*
Mar. 20	10203	25	34	79	42	0	36.08	24.03
						20	....	24.03
						100	36.26	23.25
						200	36.53	20.17
						300	35.99	15.95
						400	35.84	14.42
						800	34.85	6.16
	10204	25	33	80	03	0	36.17	21.75
						20	36.20	21.83
						100	36.17	21.07
						150	35.30	10.72
	10205	27	05	79	52	0	36.02	23.60
						20	36.08	22.88
						60	36.22	22.48
						100	36.04	19.19
						175	35.43	12.25
						250	34.85	6.90
Mar. 21	10206	27	17	79	40	0	36.09	23.75
						20	36.11	23.40
						100	36.26	23.40
						200	36.55	20.13
						300	35.82	14.71
						400	35.10	9.68
						500	....	8.53
						700	34.85	5.70
	10207	27	32	79	21	0	36.17	23.70
						20	36.17	23.60
						100	36.20	23.30
						200	36.56	19.93
						300	36.38	17.61
						400	36.08	15.78
						500	35.79	13.90
	10208	27	46	78	46	0	36.42	22.80
						20	36.44	22.42
						100	36.51	....
						200	36.53	19.91
						300	36.42	18.78
						500	36.18	16.39
						700	35.37	10.88
						800	35.03	8.26
Mar. 22	10209	27	57	78	15	0	36.44	22.23
						20	36.45	21.52
						100	36.49	20.65
						200	36.49	18.57
						400	36.11	16.11
						500	35.97	....
						700	35.26	10.08
						800	....	7.41
						900	35.01	5.98
	10210	27	59	77	25	0	36.42	21.78
						20	36.40	21.80
						100	36.51	21.56
						200	36.55	20.80
						300	36.49	17.44
						450	36.31	17.06
						600	36.00	....
						800	....	10.29
						1,000	35.10	6.04
	10211	28	08	76	48	0	36.55	20.98
						20	....	21.02
						100	36.55	20.85
						300	36.42	17.81
						500	36.22	16.29
						700	35.73	13.38
						850	....	8.57
						1,000	35.07	6.64
Mar. 23	10212	28	10	76	18	0	36.60	20.75
						20	36.56	20.90
						100	36.56	20.50
						300	36.26	17.77
						500	35.97	14.62
						750	35.10	10.01
						1,000	35.08	5.62
						1,800	35.01	3.67

DENSITY ON PROFILE CAPE FLORIDA–GUN CAY, 1914, CORRECTED FOR PRESSURE BY EKMAN'S (1910) TABLES.

Station.	Depth.	Density[a] corrected for pressure.	Station.	Depth.	Density[a] corrected for pressure.
	Meters.			*Meters.*	
10202	0	24.74	10203	0	24.47
	100	25.34		100	25.34
	200	26.65		200	26.83
	300	27.46		300	27.84
	400	28.26		400	28.61
	500	29.04		800	31.09
	700	30.03	10204	0	25.13
				100	25.84
				500	27.74

[a] At temperature *in situ*.

DENSITY OFF CHESAPEAKE, "BACHE" STATIONS, JANUARY, 1913, PRESSURE CORRECTION FROM EKMAN'S (1910), TABLE 4 ONLY.

Station.	Depth.	Density[a] corrected for pressure.	Station.	Depth.	Density[a] corrected for pressure.
	Meters.			*Meters.*	
10157	0	23.65	10158	0	26.57
	18	26.40		20	26.63
10159	0	25.92		100	27.08
	20	25.94		300	28.39
	36	26.23		700	31.04
10160	0	26.60		1,100	32.99
	20	26.69		1,800	36.20
	100	27.31	10161	0	25.58
	200	28.50		20	25.64
				100	26.10
				200	27.11
				600	29.60
				1,000	31.90

[a] At temperature *in situ*.

"ROOSEVELT" STATIONS OFF VIRGINIA CAPES, JANUARY AND FEBRUARY, 1916.

Station.	Bearings.				Date.	Depth.	Station.	Bearings.				Date.	Depth.
	Lat. N.		Long. W.					Lat. N.		Long. W.			
	°	′	°	′		*Meters.*		°	′	°	′		*Meters.*
D8442	36	55¾	75	57	Jan. 27	19	D8450	37	22¼	75	14⅞	Jan. 28	28
D8443	36	57½	75	36	Jan. 27	19	D8451 [a]	37	22	75	24	Jan. 28	13
D8444	36	57⅝	75	11½	Jan. 27	38	D8452	36	35½	75	44	Jan. 31	20
D8445	36	58	74	41½	Jan. 27	131	D8453	36	36¾	75	18⅜	Jan. 31	26
D8446	36	56½	74	36¾	Jan. 28	479	D8454	36	36⅝	74	58	Jan. 31	38
D8447	37	21¼	74	27½	Jan. 28	415	D8455	36	37	74	42⅝	Jan. 31	60
D8448	37	21⅜	74	32½	Jan. 28	94	D8456	36	37	74	40¼	Jan. 31	340
D8449	37	22	74	40⅝	Jan. 28	59	D8457	38	21	73	38	Feb. 1	125

[a] Bell buoy W. ½ N., 1½ miles.

TABLE OF TEMPERATURES, SALINITIES, AND DENSITIES AT "ROOSEVELT" STATIONS, JANUARY AND FEBRUARY, 1916.

[Density is at the temperature *in situ*, corrected for pressure by Ekman's (1910) tables.]

Station.	Depth.	Temperature.	Salinity.	Density.
	Meters.	° *C.*	‰	
D8442	0	6.11	29.34	23.12
	11	6.67	30.93	24.39
	17	6.67	32.34	25.52
D8443	0	7.22	30.79	24.13
	9	6.95	33.01	25.92
	18	7.11	33.35	26.23
D8444	0	8.33	....	....
	18	7.89	33.64	26.32
	33	8.00	33.62	26.36
D8445	0	11.39	34.63	26.43
	27.5	11.11	34.58	26.63
	55	10.83	34.56	26.68
	131	12.33	35.28	27.46
D8446	0	12.22	34.49	26.20
	55	11.83	34.96	26.81
	110	12.78	35.21	27.06
	183	11.67	35.30	27.73
	238	10.17	35.25	28.26
	478	5.89	35.05	29.84
D8447	0	10	34.38	26.50
	55	10.56	34.76	27.03
	110	12.56	35.19	27.29
	183	11.67	35.35	27.54
	238	10.56	35.21	28.24
	414	7.78	34.94	29.23
D8448	0	10.28	34.38	26.50
	27.5	10.56	34.42	26.59
	55	10.56	34.58	26.82
	92	12.22	35.12	27.14
D8449	0	8.06	33.53	26.14
	27.5	9.33	33.86	26.39
	57.5	10.67	34.09	26.93
D8450	0	6.95	33.35	26.14
	11	7.22	33.37	26.25
	16	7.00	33.37	26.29
D8451	0	5.83	32.57	25.67
	12	6.22	32.52	25.67
D8452	0	7.33	30.25	23.70
	19	7.89	33.17	25.96
D8453	0	8.33	33.64	26.18
	11	8.78	33.68	26.22
	22	8.56	33.66	26.26
D8454	0	8.89	33.96	26.34
	18	9.56	34.02	26.45
	37	10	34.23	26.52
D8455	0	9.33	34.02	26.32
	18	11.11	34.38	26.42
	55	11.39	34.61	26.66
D8456	0	12.22	34.72	26.39
	55	12.22	34.97	26.83
	110	12.67	35.05	27.07
	183	12.50	35.32	27.63
	238	11.89	35.26	27.91
	293	10.56	35.30	28.53
	337	10.11	34.97	28.53
D8457	0	12.50	34.29	25.92
	20	10.83	35.01	26.91
	55	11.11	....	....
	124	11.11	35.16	27.50

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CHE," JANUARY-MARCH, 1914,

SURVEY OF THE FISHING GROUNDS ON THE COASTS OF WASHINGTON AND OREGON IN 1915

By Edward C. Johnston

Appendix VI to the Report of the U. S. Commissioner
of Fisheries for 1915

1

CONTENTS.

Page.
Introduction 5
Résumé of the previous investigations 6
The investigation of 1915 8
  Character and topography of the bottom 9
  Flattery section 10
  Grays Harbor section 11
  Columbia River section 12
  Tillamook section 13
  Newport section 14
  Discussion of the sets 15
  Yield of the banks 17
Summary 20
Explanation of charts 20

SURVEY OF THE FISHING GROUNDS ON THE COASTS OF WASHINGTON AND OREGON IN 1915.

By Edward C. Johnston.

INTRODUCTION.

For many years rumors have been current among the fishermen of Seattle that there exist, 200 or 300 miles off the Washington coast, banks or shoal waters from which large schools of halibut come every spring. The existence of such banks is apparently the most plausible explanation of the fact that large schools of first-class halibut very often arrive on the western edge of Flattery Bank, remain for a short time, and then disappear. These schools do not appear on the eastern side of the bank, and halibut are seldom found to be plentiful along the coast of Vancouver Island. Upon the banks off the Columbia River large catches of fine halibut were made in May, 1915, but later the proportion of mushy fish became so large that fishing was discontinued.

It is believed that halibut are never notably plentiful south of the Columbia River, and it would therefore appear that these schools of halibut found on the banks off Washington and Oregon must come from the west or northwest.

The belief that such banks exist has been supported from time to time by vessels which have reported discolored water or comparatively shallow soundings. Such reports have located the supposed banks anywhere between 60 and 200 or 300 miles offshore and between the latitudes of Cape Scott, the northern end of Vancouver Island, and the Columbia River.

In the spring of 1915 several small patches of good halibut bottom were discovered by fishermen off the mouth of the Columbia River. The Bureau of Fisheries steamer *Albatross* was therefore detailed during the months of July, August, and September, 1915, to investigate the existence of fishing banks offshore, and to locate the new fishing grounds off the Columbia River, as well as in the region between the Columbia River and Flattery Bank.

The investigation was a continuation of the work started in 1914, and includes: (*a*) Soundings made on July 9 off the Columbia River; (*b*) a sounding and fishing trip, July 19 to 28, covering the region between Grays Harbor and Flattery Bank and including four fishing trials; (*c*) a sounding trip August 9 to 19, over a strip 60 miles wide and approximately 300 miles long west of Cape Flattery; (*d*) a sounding trip September 2 to 11, extending from Grays Harbor south to Cascade Head. No fishing trials were made on the second and third trips.

Credit is given to the commanding officer of the steamer *Albatross*, Lieut. Commander J. J. Hannigan, United States Navy, and to the officers under him for their willing and efficient cooperation during the investigation. The expert knowledge and advice of Mr. Edward Driscoll, in charge of the fishing operations, contributed largely to the success of the work. The fishermen of Seattle have contributed much in the way of advice and information, and the files of The Pacific Fisherman have supplied many items of valuable information.

RÉSUMÉ OF PREVIOUS INVESTIGATIONS.

Since the year 1885 various desultory fishing trials have been made off the Washington and Oregon coasts. Early in that year the Portland Deep Sea Fish Co., of Portland, Oreg., sent out a small schooner equipped with a 40-foot beam trawl. In 1887 another trial was made, and although flounders, soles, red rock cod, and a very few halibut were taken by both of these vessels, the trips were not successful.

In 1888–1890 the steamer *Albatross* carried on an investigation off the coast from Cape Flattery southward, and found four banks,[a] as follows:

1. Flattery Bank, 1,100 square miles, least depth 27 fathoms, off Cape Flattery.
2. Willapa Bank, 110 square miles, least depth 42 fathoms, 23 miles W. by S. (magnetic) from Toke Point Light, Willapa Bay.
3. Yaquina Bank, 40 square miles, least depth 42 fathoms, 19 miles SSW. ¼ W. (magnetic) from Yaquina Head.
4. Heceta Bank, 300 square miles, least depth 41 fathoms, 35 miles SW. ½ W. from Heceta Head.

In this work but few halibut were taken, several species of rock cod were found to be generally distributed, and flounders and cultus cod were abundant on all the banks.

During the summer of 1914 the United States Bureau of Fisheries conducted an investigation of the fishing grounds off the coast of Washington and Oregon. The greater part of this work was confined to the region between Heceta Bank and the Columbia River, although some time was given to the sections off Grays Harbor and Coos Bay. In all, 38 sets were made for halibut with varying success, resulting in the conclusion that if halibut were to be found off the Oregon coast in paying quantities, they would occur as a seasonal run when they came inshore to feed. It was apparent that there were no banks of sufficient size nor of a character to hold the fish the year around.

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[a] Summary of the fishing investigations conducted in the North Pacific Ocean, by Richard Rathbun. Bulletin of the U. S. Fish Commission, vol. XII, 1892, p. 127–205.

As a result of these investigations, many vessels of the Seattle halibut fleet made trips to the Newport Bank and obtained excellent catches. During the period from May 10, 1914, to September 15 of the same year 853,300 pounds of halibut were caught.[a] This total does not include several fares about which no definite information could be secured.

The following comparison of the yield of fish on the Newport and the Alaska Banks is taken from the report of the investigations of 1914:[b]

> In August, 1914, the average schooner trip (inclusive of mushy fish) from Oregon was 42,800 pounds, 3,000 pounds less than the average schooner fare landed at Seattle during the same month. Compared with the average trip for the same month of the previous year, the Oregon catch was about 100 pounds greater.
>
> In September the average trip from the Newport Bank exceeded by over 15,000 pounds the average of all schooner trips landed in Seattle in September of either year. The average catch of sound fish alone from off Newport during this month compares favorably with the average Seattle fare including mushy fish, being 34,667 as against 38,343 pounds at Seattle in 1914, and 38,657 pounds in 1913. The Seattle averages are based on 38 trips in 1913 and 70 in 1914, whereas the Newport data include but 6 trips.
>
> To all appearances, within the fishing area off Newport, halibut are as plentiful, at least in August, and especially in September, as on the various northern banks fished by the Seattle schooners. It may be said that with the great number of northward trips there is greater possibility for making poor ones; but a few of these would not materially reduce the Seattle average, based on so many trips, whereas a few from Newport would have reduced that average to an insignificant quantity.

Flounders, sole, red rockfish, black cod, and dogfish, although not marketed extensively, were found to be present on this part of the Pacific coast in considerable quantities.

The summarization of the results of the investigations of 1914 is quoted verbatim:[c]

> The investigation developed the existence of a nice run of halibut during a period of at least two months on a bank having an area of approximately 250 square miles, off Newport, Oreg. The run attained its maximum in August and September, but fish were present in June and July. A profitable fishery probably could be conducted at that time, and at certain places might possibly be engaged in as early as the latter part of April. Irrespective of the abundance of fish, however, the weather conditions and lack of shelter will restrict fishing to the period from April to September. In 1914 this run yielded commercial catches totaling over 850,000 pounds of halibut in 21 trips, for which $23,646.25 was received by the fishermen. Average trips of 40,000 pounds were caught in four days or less, the fish averaging 27 pounds in weight.

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[a] Survey of the fishing grounds on the coasts of Washington and Oregon in 1914. Bureau of Fisheries Document no. 817, p. 29.

[b] Idem, p. 23.

[c] Idem, p. 27.

Mushy fish occur to the extent of 30 to 40 per cent of the total catch, but in view of certain returns from Alaska during the same year (1914) this proportion does not seem greater than on other Pacific coast grounds.

Halibut may be expected in limited quantities off Coos Bay, on a considerably smaller and less developed patch of bottom, and possibly off Grays Harbor at some season of the year, as a good piece of bottom was located in that vicinity, although not a halibut was caught thereon. With respect to halibut and halibut bottom, the section of the coast lying off Tillamook seems to be the least favorable.

On the other hand, throughout practically the entire reach of the Oregon coast, there seems to be an abundance of the smaller flatfishes, some of which are food fishes of great excellence. The red rock cod, and doubtless black cod, occur in great abundance. Dogfishes are so numerous at times as to be a nuisance.

Scallops apparently are to be found over a wide range of territory, and in some places probably form beds thickly enough populated to warrant fishing, though the depth in which they lie may militate against taking them commercially.

In conclusion, the harbor and market facilities, bait supplies, transportation, and cold storage are perhaps too limited and uncertain to enable any of the Oregon coast ports to become fishing centers of any great consequence under present conditions. The limitation of the fishing season by weather conditions is possibly the greatest handicap in competition with Seattle and its proximity to the vast, year-round Alaska fishery resources. No doubt the Newport Bank will provide a valuable addition to the available supply of halibut, and the greater part of the Oregon coastal region will furnish a future source of supply of flounders, sole, black cod, and red rockfish, which at present find but a limited market, if any.

THE INVESTIGATION OF 1915.

On July 6, 1915, the steamer *Albatross* left Sausalito, Cal., for Seattle to pick up the fishermen and to obtain necessary supplies and gear. On July 9 a series of soundings was made immediately west of the mouth of the Columbia River. These soundings disclosed the presence of a gully 150 fathoms deeper than the inclosing ridges, 12 miles long by 4 miles wide, extending westward from a point approximately 12 miles offshore. The northern ridge of this gully was definitely located, and although no good halibut bottom was found, there probably exist small areas along the edge of the ridge where halibut may be taken.

On July 20 operations were begun at a point west of Grays Harbor. The work was continued in a northerly direction to the edge of Flattery Bank, the soundings, with few exceptions, being confined to the edge of the continental shelf. The method of work was to run lines of soundings between the 70 or 80 fathom curve and a depth at which fishing would be impractical. These lines were run several miles apart. It was demonstrated that there are many small patches of good halibut bottom scattered through this region, no less than 14 being located on this trip. Owing to the small size of these areas of good bottom, they probably hold the fish for only a short time. Four fishing trials were made, the results of which are discussed elsewhere in this report.

Between August 9 and 19 a search was made for possible offshore banks. The first line of soundings began at the edge of the continental shelf west of Destruction Island and extended westward a distance of approximately 300 miles. Three other lines of soundings were run north of the first one, parallel with it and about 20 miles apart. Soundings were made to a depth of 500 fathoms at 5-mile intervals, and every fifth sounding was extended to the bottom. No bank was found which could be fished upon, but a submarine elevation was located whose summit lies at a depth of only 525 fathoms. This has been named "Gibson Bank," in honor of Mr. John Gibson, manager, Fishing Vessel Owners' Association of Seattle.

Between September 2 and 11 sounding operations were resumed along the 100-fathom line west of Grays Harbor, which work was extended southward as far as Cascade Head, the same methods being used as in the work in July. Very few patches of favorable bottom were found.

As the halibut fishermen have repeatedly expressed their willingness to make fishing trials, provided they knew the location, depth, character of the bottom, etc., of a bank, the work of this cruise was confined to determining the location of new or unknown banks rather than to the determination of the fishing value of any bank.

CHARACTER AND TOPOGRAPHY OF THE BOTTOM.

The region covered by this investigation is confined, for the most part, to a narrow strip lying along the edge of the continental shelf in the vicinity of the 100-fathom curve. This course was decided upon in view of the limited time at the disposal of the survey, and the probability that a coarse or rocky bottom would be found whereever a ridge or a rapid change in depth exists.

The data collected have been entered upon five Coast and Geodetic Survey charts which include the coast line from Cape Flattery to Coos Bay. The charts, as reproduced, are sections of the originals: Chart 1 is a section of Coast and Geodetic Survey chart No. U, including Cape Flattery. Chart 2, Cape Flattery to Grays Harbor, is a section of Coast and Geodetic Survey chart No. 6400; Chart 3, Willapa Bay to Cascade Head, is compiled from sections of Coast and Geodetic Survey charts No. 6000 and 6100; Chart 4, Cape Foulweather to Coos Bay, comprises section of Coast and Geodetic Survey charts No. 5900 and 6000.

The 100, 50, and 20 fathom contour lines have been corrected or extended to conform with the soundings made at this time. All depths over 30 fathoms are indicated, the center of the figure being the spot where the sounding was made. The character of the bottom is noted near the sounding at which it was obtained. Favorable patches of good halibut bottom are located by dotted lines and numbered with Roman numerals. In Chart 3, Willapa Bay to Cascade Head, one reported halibut fishing ground which was not found by the *Albatross* is indicated by a different style of dotted lines.

In taking up the discussion of the character and topography of the bottom the region investigated during 1915 falls naturally into four sections and that investigated during 1914 into three, viz: (*a*) Flattery section, in which four lines of soundings were made from the edge of the continental shelf extending seaward 300 miles; (*b*) Grays Harbor section, reaching south from the edge of Flattery Bank to Grays Harbor; (*c*) Columbia River section, which takes in the area off the Columbia River and south to Tillamook Bay, where (*d*) Tillamook section begins; this runs south to Cascade Head; (*e*) Newport section; (*f*) Heceta Bank section; and (*g*) Coos Bay section. The last three were covered by the 1914 investigation.

Flattery section.—Extending 50 miles west of Cape Flattery, the continental shelf contains numerous outcroppings of rocky ledges and patches of pebbles and gravel. At the western edge the bottom, which drops to a depth of 1,000 fathoms in a distance of 25 miles, is composed largely of gray sand changing to green or gray mud as the depth increases. On the first line of soundings this green mud persists for over 100 miles, beyond which it is replaced by a brown ooze. On the other three lines the brown ooze is found inshore to the 1,000-fathom line. Only at one sounding was Globigerina ooze found, although the calcareous remains of Foraminifera were present in nearly every sample of the bottom. At one station the mud appeared nearly black, while at one other a sample of yellow mud was obtained.

Lying 279 miles west-southwest (S. 66° W. true) from Cape Flattery, Gibson Bank was discovered with a surrounding depth of over 1,500 fathoms. It was first located at a depth of 635 fathoms, and at an interval of 2 miles the minimum depth of 525 fathoms was obtained. Two miles farther the depth increased to 830 fathoms and after a run of 25 miles to 1,600 fathoms. A series of soundings were made around the 525-fathom depth with the result that no bottom was found at 700 fathoms. From all indications Gibson Bank is an isolated submarine peak with a summit less than 2 miles in diameter. The same brown ooze which predominates over this section outside the 1,000-fathom curve is found covering Gibson Bank. Specimens of Foraminifera (Globigerina) are present, but not in sufficient numbers to warrant characterizing the bottom as Globigerina ooze. The discovery of this bank adds strength to the rumors of shoal water lying off Cape Flattery and off Cape Scott, the northern end of Vancouver Island, and it is possible that a bank or banks of greater or less extent exist off the northwest coast.

Grays Harbor section.—Good halibut bottom should be found in this region, although soundings at this time failed to indicate such a place. The following paragraph is taken from the report on the 1914 survey:[a]

> Off Grays Harbor the continental shelf, which here attains a width of 25 to 30 miles, is covered from shore outward to between the 40 and 50 fathom curves with fine gray sand, and beyond that line out into deep water is composed almost uniformly of green mud. An outcrop of shale was found on one sounding about 25 miles west of Point Chehalis. In the vicinity of Chehalis Bank, reported by Capt. Tanner, the soundings increased regularly in depth offshore, and showed nothing but green mud from the 46-fathom mark to a depth of 64 fathoms and doubtless beyond that. To the northward of this reported bank, and between 10 and 15 miles offshore, a patch of gravel bottom was found in 38 to 40 fathoms.

The patch of gravel mentioned in the latter part of the above extract was relocated during the present investigation and found to be at least 6 miles in diameter. Between this and the 100-fathom line the bottom was found to be composed of fine gray sand or of green mud.

An extensive ledge of hard and granular shale lies along the 100-fathom line 31 miles west of Point Chehalis. In the same locality an outcrop of hard, rocky shale covered the bottom at a sounding of 279 fathoms.

From 35 to 40 miles northwest of Point Chehalis the bottom is very irregular, dropping from 77 fathoms in depth to over 200 fathoms within a distance of a mile. The depths on a line of soundings at 1-mile intervals proved to be $\frac{\cdot}{200}$, 115, 110, $\frac{\cdot}{200}$, $\frac{\cdot}{200}$, and 77 fathoms.[b]

With the exception of the spots tabulated below, the bottom was found to be composed mainly of green mud or of gray or black sand of varying degrees of coarseness. At one sounding, 37 miles northwest of Grays Harbor, a sample of fine white sand with a few black specks was obtained.

There were located in this section 14 patches of good or favorable halibut bottom. In fact, good bottom may be found everywhere along the 100-fathom line between the depths of 90 and 115 fathoms. Perhaps the most promising locality is at the northern limit of operations along the southeast ridge of the deep channel which separates Flattery Bank from the coast of Washington. The bottom here is of coarse gravel, rocks, and coarse sand. A tabulated list of the most favorable bottoms follows, with location and the character of the bottom:

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[a] Survey of the fishing grounds on the coasts of Washington and Oregon in 1914. Bureau of Fisheries document no. 817, p. 13.

[b] The character $\frac{\cdot}{\;}$ means no bottom found at the depth indicated.

TABLE 1.—GOOD HALIBUT BOTTOMS IN GRAYS HARBOR SECTION.

No.[a]	Bearings.	Distance.	Character of bottom.[b]	Approximate area.
		Miles.		*Sq. miles.*
1	WSW. ¾ S. (S. 60° W.) from Umatilla Lightship.	21	G; crs bk S; crs and fne gy S; R; gn M.	18
2	SSW. (S. 22° W.) from Umatilla Lightship.	25	fne bk G; gn M; gran Shale	1
3	SSW. ¼ S. (S. 18° W.) from Umatilla Lightship.	31	G; fne bk S	1
4	S. by W. (S. 12° W.) from Umatilla Lightship.	37	G; bk S; Sh; gy S; gn M	16
5	S. ¼ W. (S. 4° W.) from Umatilla Lightship.	39	G; crs bk S	1
6	NW. by W. (N. 54° W.) from Grays Harbor Light.	37	crs bk S; gn M	1
7	WNW. (N. 65° W.) from Grays Harbor Light.	39	G; crs and fne gy and bk S	3
8	WNW. (N. 68° W.) from Grays Harbor Light.	35	G; Sh; fne gy S; gn M; crs and fne bk S.	3
9	WNW. ½ W. (N. 73° W.) from Grays Harbor Light.	37	G; crs bk S; fne gy S; gn Shale	1
10	WNW. ½ W. (N. 75° W.) from Grays Harbor Light.	34	G; bl M; crs bk S; fne gy S	1
11	W. by N. (N. 80° W.) from Grays Harbor Light.	33	fne G; fne gy S	3
12	NW. (N. 46° W.) from Grays Harbor Light.	22	crs bk S	1
13	WNW. (N. 65° W.) from Grays Harbor Light.	16	crs G	40
14	W. by S. ½ W. (S. 83° W.) from Grays Harbor Light.	31	G; crs bk S; fne gy S; gran Shale	16

[a] Numbers refer to areas on chart 2.

[b] Abbreviations descriptive of the bottom: G, gravel; crs, coarse; bk, black; S, sand; fne, fine; gy, gray; R, rock; gn, green; M, mud; gran, granular; Sh, shell; bl, blue.

Columbia River section.—This section includes the region from Willapa Bay to Tillamook Bay. Off Willapa Bay a uniform bottom of fine gray sand predominates out to the 100-fathom line, beyond which there are occasionally found small areas of coarse black sand, blue mud or shale, and in one instance granular shale. Granular shale appears as a pseudogravel, but the nodules can be easily pressed together in the hands.

Twelve miles west of Cape Disappointment is the eastern end of a long, narrow gully which extends to the westward approximately 12 miles and which is 3 to 4 miles wide and 150 fathoms deeper than the inclosing ridges. The floor of this gully is covered with green mud, while the continental shelf to the north and east is regularly composed of fine gray sand. From the Columbia River southward the gray sand is replaced by green mud with a trace of gray sand which can not be detected until the mud is washed away. Along the south ridge of this gully several successful catches of halibut have been made during the spring of this year. Soundings here showed an outcrop of shale. Trials upon the north ridge would probably show that region to be worth fishing upon a large scale. Five outcrops of shale were found in this area, along the 100-fathom line. In fact, each time a line of soundings crossed the 100-fathom curve, hard blue mud or shale was obtained.

In May, 1915, a halibut bank was reported as lying 16 miles nearly southwest from the Columbia River Lightship in 80 fathoms. That this is a small patch is probable, as soundings made in this locality failed to discover any good fishing ground.

The report of the 1914 investigation says of the area within the 60-fathom line:

> On the fine gray sand within the 60-fathom curve, about 9 miles south of Tillamook Rock, a small patch of shale resembling hard mud was discovered, but an attempt to relocate it later proved unsuccessful. Between Cape Falcon and Tillamook Bay coarse gray sand was found on a single sounding, in 32 fathoms. From all indications it is doubtful if halibut will be found here in paying quantities, although it is the most promising bottom found off Tillamook. * * * The bottom throughout the Tillamook section seems to be generally unfavorable for halibut, though it supports a great many of the smaller flatfishes and other, at present, less marketable species.[a]

The positions and character of bottom of the most favorable patches of bottom are tabulated below. It will be seen that they are all small.

TABLE 2.—GOOD HALIBUT BOTTOMS IN COLUMBIA RIVER SECTION.

No.[a]	Bearings.	Distance.	Character of bottom.[b]	Approximate area.
		Miles.		*Sq. miles.*
15	W. from Cape Shoalwater Light	32	gn M; Shale	1
16	S. by W. (S. 9° W.) from Cape Shoalwater Light.	24	hrd bl M	2
17	W. by N. ½ W. (N. 85° W.) from Columbia Lightship.	12	bl Shale	2-4
18	SW. ½ W. (S. 50° W.) from Columbia Lightship.	16	gn M	Reported.
19	WSW. (S. 70° W.) from Columbia Lightship.	17	bl M; fne G	1
20	WSW. ½ W. (S. 73° W.) from Columbia Lightship.	22	bl M; gran Shale	1
21	SW. by W. (S. 58° W.) from Columbia Lightship.	21	bl M; gran Shale	1
22	W. (N. 88° W.) from Tillamook Rock Light.	25	G; gran Shale	1
23	W. by S. ¾ W. (S. 87° W.) from Tillamook Rock Light.	22	rky Shale	3
24	W. by S. ¼ W. (S. 82° W.) from Tillamook Rock Light.	23	bk S; gran Shale; rky G	2
25	W. by S. ½ W. (S. 84° W.) from Tillamook Rock Light.	26	fne G	1
26	W. by S. (S. 78° W.) from Tillamook Rock Light.	28	gran Shale; bk S	4
27	SW. (S. 46° W.) from Tillamook Rock Light.	26	G	1
28	SW. ½ S. (S. 40° W.) from Tillamook Rock Light.	9	Shale; hrd M	1
29	SW. by S. (S. 64° W.) from Tillamook Rock Light.	27	Shale; hrd M	2

[a] Numbers refer to areas on chart 3.

[b] Abbreviations descriptive of the bottom: G, gravel; gn, green; M, mud; hrd, hard; bl, blue; fne, fine; gran, granular; rky, rocky; S, sand; bk, black.

Tillamook section.—Along the edge of the continental shelf in the northern part of this section are found the Miocene shales which showed in numerous outcroppings in the Columbia River and Grays Harbor sections. The whole of this section and south to Cape Foulweather is barren of possible fishing grounds; only two spots were located. The continental shelf, 30 miles wide off Tillamook Head on the north narrows to 12 miles off Cape Kiwanda in the south and is covered throughout with green mud.

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[a] Survey of the fishing grounds on the coasts of Washington and Oregon in 1914. Bureau of Fisheries document no. 817, p. 14.

West of Tillamook Rock, 25 to 30 miles, was discovered an area of gravel, coarse sand, blue mud, and granular shale. A small patch of gravel bottom was located 22 miles west of the mouth of Nehalem River. Near Cascade Head there is a patch of fine gravel in 42 fathoms, near which, in 1914, a good scallop catch was made.

Newport section.—The Tillamook section marked the southern limit of the 1915 investigation, but for completeness a brief description of the Newport, Heceta Bank, and Coos Bay sections is taken from the report on the 1914 survey:

> Between Yaquina and Alsea Bays and about 12 miles offshore, a ridge was discovered on which 30 fathoms was the minimum sounding made by the *Albatross*, although Capt. Carrol, until recently of the *Decorah*, reports that he made one sounding of 20 fathoms in this vicinity. This ridge is the outer wall of a submarine valley having, so far as sounded, an extreme depth of 47 fathoms, shoaling at its mouth to 42 fathoms and merging with the flat of the continental shelf at the 50-fathom curve. On both sides of the ridge, and principally at the upper end of the submarine valley formed by it, the late summer run of halibut, developed by this survey, was found. The bottom across the head of the valley and through the greater extent of its floor is of coarse gray sand, carrying a very rich growth of such organisms (sea anemones and pennatulids) as are typically found on good halibut bottom.
>
> Over the ridge and principally on its northwestern and southern slopes is found what has been designated as broken bottom—composed of materials of a mixed character, shale, gravel, sand, and mud—in patches varying in size and composition, but all very rich in bottom-living organisms. On the western slope is a patch of coarse gray sand and another of gravel, apparently of considerable extent, though no great number of soundings were made there. On this patch a good lot of fish were taken.
>
> *Heceta Bank section.*—Similar to the ridge off Newport, but larger and in somewhat deeper water, there is a large, roughly triangular plateau called Heceta Bank, between 25 and 30 miles offshore to the southwestward of Heceta Head. It is composed largely of shale too hard for good halibut bottom, while the submarine valley formed by it is too soft, having a bottom of soft green mud. Several patches each of broken bottom and black sand occur both on the flat of the bank and on the offshore slopes. The most promising broken bottom is in the vicinity of set XI, where a lot of fish were taken in the spring of the year (set I). Black sand is considered good black cod bottom and on one patch of it (set X) a fair catch was made.
>
> Between Heceta Bank, Alsea Bay, and Heceta Head is a large area of fine gray sand which below Heceta Head is encroached upon by the green mud of the submarine valley formed by Heceta Bank. Off the mouth of the Siuslaw River is a small isolated patch of gravel surrounded by fine gray sand. The mud line trends in from the 70-fathom line toward the Umpqua River, where it reaches the 30-fathom curve less than 2½ miles offshore. Another gravel patch about 7 miles below the Umpqua River lies within this mud area but 6 miles from shore, and south of this the mud recedes until it lies beyond the 70–80-fathom line 10 miles off Coos Bay.
>
> *Coos Bay section.*—In a line between the Umpqua River and Coos Bay, three sets (XXVII, XXIX, and XXX) were made on fine gray sand, which occurs everywhere in this region inshore of the mud. As developed by the above sets, this sand bottom

seems to carry a thin surface film of mud or else the line of demarcation between the two extends much nearer shore than has been shown either by the chart or by the soundings.

Southward of Coos Bay, extending well toward the Coquille River, is a comparatively extensive outcrop of shale, rich in bottom organisms, in which the soundings developed two areas of good halibut bottom, fine gravel. The soundings, together with the yield of set XXVIII, seem to indicate that more detailed examination might locate areas of so-called broken bottom, which is more productive of fish than shale alone.[a]

DISCUSSION OF THE SETS.

On account of the fact that the fishermen of Seattle were willing and desirous of testing any new halibut ground if its location and character were given them, and because of the limited time available for the survey (two and one-half months), it was considered more practicable to make a small number of fishing trials and to spend all of the time in locating new banks. Consequently four practical fishermen were taken on the first trip and four trial sets were made. Two fishermen were taken on the second trip, but no halibut bank was discovered (the trip was offshore in deep water) and no sets were made. On the third trip no fishermen accompanied the vessel except the expert fishermen, who remained during the whole survey.

Arrangements were made to carry, in the ship's refrigerator, enough fresh frozen bait for one trip. Fresh salmon could not be obtained at a reasonable price at the time bait was purchased, but some excellent frozen herring were secured and a reserve supply of salt herring was carried. Fresh salmon has been found to be a better halibut bait than herring, the better results warranting the payment of a higher price.

An 8-line trawl, carrying about 250 hooks spaced 9 feet apart, was used in the same manner as is customary among the commercial fishermen. The sets were all double-banked and made with two skates of line. The trials each lasted an hour. While the set was being made the surface and bottom temperatures were taken; surface and bottom water samples secured; and tow net hauls made with nets of three sizes of mesh.[b]

The results of the four fishing trials are shown in table 3 together with the locations of the sets. The bearings are given as a fisherman would give them.

Set I.—On July 21, SW. by W. ⅓ W. (magnetic) 19.1 miles from Destruction Island, a bottom of gravel and coarse black sand was found in 88 fathoms. A set of one hour resulted in five halibut, weighing 22, 32, 44, 48, and 50 pounds, respectively, all being first-class fish. The 50-pound fish was a male and the rest females. A blue shark 83 inches long and weighing 64 pounds and one cultus cod 42 inches long were caught. Black cod were abundant (44 taken) and red rock cod numerous, 29 being taken on the trawl. Dogfish and blue sharks occurred in moderate numbers.

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[a] Survey of the fishing grounds on the costs of Washington and Oregon in 1914. Bureau of Fisheries document no. 817, p. 14.

[b] No. 000 grit gauze; no. 12 and 20 bolting silk.

Set II.—On July 21, W. by S. ⅓ W. 21.8 miles from Destruction Island, a bottom of gravel, gray and black sand, shells, and green mud were found. The next day the spot was located and a trial made in 101 fathoms. Eight halibut were taken, two being males weighing 46 and 26 pounds. As in sets I and III the largest halibut proved to be males, although in the four sets 14 females and 4 males were taken. Black cod were exceptionally numerous and of a large size, 71 being caught, 1 of which weighed 36 pounds. In this set 20 dogfish and 19 blue sharks were secured. A small stone covered with worm casts, sponges, etc., was brought up on the trawl.

Set III.—Too late to make a set on July 23, a patch of good halibut bottom was found in 99 to 124 fathoms W. by S. ½ W. 31 miles from Grays Harbor Light. On July 24 a set was made on the edge of this patch in 98 fathoms where the sounding lead showed as fine green sand. The offshore ends of the two trawls evidently fell on a gravel bottom, because both of them brought up small stones the size of ducks' eggs and covered with organic remains. But 2 halibut were obtained on this set, 1 on each trawl, weighing 22 and 24 pounds, respectively, the latter being a male. A number of other fish, 21 black cod (9 young), 7 blue sharks, 2 dogfish, 3 arrow-toothed halibut, and 1 flounder, were caught.

Set IV.—On July 22 good bottom of gravel and coarse sand, together with a little green mud, was found on the southern ridge of the deep channel which separates Flattery Bank from Cape Flattery. A set was made on this ridge on July 27, SW. by W. 20.7 miles from Umatilla Lightship. Three halibut were secured weighing 94, 55, and 30 pounds, all females. About 150 black cod weighing 40 to 50 pounds, 10 dogfish, and 8 blue sharks were caught. The black cod, according to the fishermen, were the largest and most numerous they had ever seen. Only one trawl could be hauled in; the other was bitten off at both ends by sharks as soon as the haul in was started. Many of the black cod were cut in two by the sharks, numbers of which continually swam around the ship at the surface of the water. From the number of birds ("black hags," gulls, etc.), whales, and sharks, the proximity of good feeding grounds was plainly evident.

TABLE 3.—LOCATIONS AND RESULTS OF HALIBUT FISHING TRIALS OFF THE COASTS OF WASHINGTON AND OREGON BY THE STEAMER "ALBATROSS," 1915.

Set No.	Position. (All bearings magnetic.)	Date.	Depth.	Character of bottom.
		1915.	*Fms.*	
I	SW. by W. ⅓ W. (magnetic) distant 19.1 miles from Destruction Island.	July 21	88	Gravel, coarse black sand.
II	W. by S. ⅓ W. distant 21.8 miles from Destruction Island.	July 22	101	Gravel, green mud, fine gray sand.
III	W. by S. ½ W. distant 31 miles from Grays Harbor Light.	July 24	98	Fine green sand.
IV	SW. by W. distant 20.7 miles from Umatilla Lightship.	July 27	95	Gravel, fine and coarse gray sand.

TABLE 3.—LOCATIONS AND RESULTS OF HALIBUT FISHING TRIALS OFF THE COASTS OF WASHINGTON AND OREGON BY THE STEAMER "ALBATROSS," 1915—Continued.

Set No.	Number of skates of gear used.	Duration of set.	Bait.	Fish taken (catch).					
				Halibut (Hippoglossus).					
				Number taken.	Range of size.	Total weight.	Average weight.	First class (between 11 and 80 lbs.).	Average weight of first class.
		Hours.			*Inches.*	*Pounds.*	*Pounds.*		*Pounds.*
I	2	1	Live herring, frozen.	5	22-50	196	39.2	5	39.2
II	2	1	.....do........	8	10-46	225	28.1	7	30.7
III	2	1	.....do........	2	22-24	46	23.0	2	23.0
IV	2	1	.....do........	3	30-94	179	59.7	3	59.7

Set No.	Fish taken (catch)—Continued.										Addenda.
	Dogfish (Squalus sucklii).	Blue shark (Prionace glauca).	Skates (Raja binoculata).	Rock salmon (Sebastodes paucispinis).	Red rock cod (Sebastodes ruberrimus).	Black cod (Anoplopoma fimbria.)	Cultus cod (Ophiodon elongatus).	Sole (Eopsetta jordani).	Flounder (Psettichthys melanostictus).	Arrow-toothed halibut (Atheresthes stomias).	
I	7	6	......	1	29	44	1	......	......	......	Double-banked set; 4 females, 1 male halibut; 1 blue shark 83 in. long, 64 lbs.; 1 cultus cod, 42 in. long.
II	20	19	1	1	1	71	1	1	......	2	Double-banked set; 6 females, 2 males; 1 black cod, 36 lbs.; 1 small stone with worm casts, sponges, etc., attached.
III	2	7	......	......	......	21	......	......	1	3	Double-banked set; 1 female, 1 male; a large sea anemone; 3 rocks, size of duck's egg, covered with orgnaic remains.
IV	10	8	......	......	......	150	......	......	......	......	All females; many black cod exceptionally large (40-50 lbs.); many indications of a good halibut bank; birds dipping over water, many sharks, whales, etc., 1 line bit off at both ends by sharks and lost.

YIELD OF THE BANKS.

On July 25, while at anchor off Grays Harbor buoy, handlines were used for about an hour and a half and 150 hake (*Merluccius productus*), 2 dogfish, 1 rockfish (*Sebastodes pinniger*), and 3 "sole" (*Eopsetta jordani*) were caught. The hake proved unpalatable, the flesh being watery and tasteless.

Food of the halibut.—Just over the edge of the continental shelf, where the water rapidly deepens, will be found many strips of gravel, rocky or broken bottom. It is on these patches that halibut are found. Many of the fishermen think that there is a seepage of fresh water which carries away the mud and fine sand and which attracts the bait and the halibut themselves. On such a bottom will be found growing sea anemones, pennatulids, crabs, starfish, and other organisms which form part of the food of the halibut.

Mr. Thompson [a] says of the food of the halibut:

> The food of the halibut is well known to exhibit great variety, but the data recently collected indicate that it differs widely on different banks and may be quite limited in any given locality. The range of food has been found to include crabs, sea-anemones, starfish, sand-lance (*Ammodytes personatus*), dogfish (*Squalus sucklii*), ratfish (*Chimæra*) (*Hydrolagus*) (*colliei*), Cyclogasterids (of determined species), the arrow-toothed halibut (*Atheresthes stomias*), octopi, gray cod (*Gadus macrocephalus*), salmon (*Oncorhynchus kisutch*), and even occasional red cod (*Sebastodes*). It is here deserving of remark that the crabs and the gray cod form the vast bulk of the food on many banks, while on at least one the halibut used mainly the sand-lance. The crabs and sand-lance were eaten by halibut of small size generally in shallower line. Thus, in 90 fathoms off Middleton Island, of 130 stomachs, 59 per cent were empty, 39 per cent had gray cod, 2 per cent had crabs and the arrow-toothed halibut. * * * Usually but a single kind of food was found identifiable in a single stomach, although this was far from being a rule. A large quantity of the particular kind of food is usually found, indicating that the halibut has not moved so rapidly as to leave the type of bottom on which it was found before the food caught was digested. The presence of small worms serves to indicate the capacity the halibut has for picking up minute foods.

The problem of the mushy halibut is one that must be solved in the near future. As much as 50 per cent of the fish, when delivered at the market, have been found to be mushy and, hence, unsalable. At the time they are caught the affected fish can not be separated from the good fish, but after being on ice for some time the meat becomes soft and can easily be shaken from the bones.

There are two kinds of mushiness—milky halibut and white-meated halibut. In the former case (milky) the meat will become soft and falls away from the skin and bones. In the latter variety (white-meated) there will be found running through the white flesh what might be called lean meat. When culling fish a small gash is made in the tail whereby the condition of the meat is made apparent. Sometimes only part of the fish is mushy; the tail may be mushy and the body good, and again the reverse may be true. As to the cause of this condition of the halibut, nothing but theories has been advanced up to the present. The Bureau has the matter under investigation.

In addition to the halibut, black cod (*Anoplopoma fimbria*) was found to be abundant at all points between Grays Harbor and Flattery Bank. Near Flattery Bank exceptionally large ones occurred in great abundance. The survey of 1914 reported that, from all indications, black cod could be fished in the deep water just off the southern and western slopes of Heceta Bank. Fresh black cod is a good table fish and in some places it is considered a delicacy.

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[a] A preliminary report on the life history of the halibut. Report of the Commissioner of Fisheries for the Province of British Columbia, for the year ending December, 1914; also a Progress Report in the Canadian Fisherman for December, 1915.

The rock cods or rockfishes occur abundantly over the whole region surveyed in 1914 and 1915. The halibut fishermen do not take these fish, of which there are many species, but small local boats take and market them.

At San Francisco several companies carry on large fishing operations for flounders and sole, but farther north the interest lies with salmon, halibut, etc. While making dredge hauls for scallops during 1914, flounders were taken in great quantities and to all appearances were in greater abundance than off San Francisco Bay. This should prove a profitable industry if properly taken up.

During the latter part of June and the first half of May practically the whole of the Seattle fishing fleet were fishing off the Columbia River. It is reported that 2,000,000 pounds of halibut were taken at that place. From 50 to 60 boats could be seen at one time fishing on an area not over 2 miles square. Prince Rupert and Vancouver boats also visited this bank. As the percentage of mushy fish increased from a nominal percentage at first to 50 per cent of the catch, the fleet moved north to Hecate Strait and landed its fares at Prince Rupert.

But three schooners have fished south of Cape Flattery since that time: The *America* took 40,000 pounds, 50 per cent of which were mushy; the *Daisy* landed at Prince Rupert a fare of 20,000 pounds, the percentage of mushy fish was not reported; and the *Mary* took 5,000 pounds early in September, reporting that there were not nearly the number of fish on the Newport Bank as there were in 1914. The *Daisy* reported that there were "quite a few fish off Newport."

In the accompanying table a comparison is made of the amount of fish taken from the banks off the coasts of Washington and Oregon during the years 1914 and 1915. There are no records available for May, 1915, or October, November, and December, 1914.

TABLE 4.—QUANTITY AND VALUE OF HALIBUT CAUGHT BY THE COMMERCIAL FISHERMEN OFF THE COASTS OF WASHINGTON AND OREGON DURING THE SEASONS OF 1914 AND 1915.

Month.	1914			1915		
	Number of trips.	Catch.	Value.	Number of trips.	Catch.	Value.
		Pounds.			*Pounds.*	
May	2	18,200	$683.00	(a)	(a)	(a)
June	1	22,800	684.00	63	1,620,000	$85,511.50
July	5	119,500	5,098.75	4	13,000	937.50
August	6	186,800	6,925.50	2	5,200	285.50
September	7	271,000	10,255.00	6	38,000	2,037.00
October	(a)	(a)	(a)	1	1,930	135.10
November	(a)	(a)	(a)	0	....	....
December	(a)	(a)	(a)	1	5,000	375.00
Total	21	618,300	23,646.25	77	1,683,130	89,281.60

[a] The returns for the months of October, November, and December, 1914, and May, 1915, are not available but they are probably small.

SUMMARY.

Along the edge of the continental shelf, in depths from 80 or 90 to 120 fathoms, good or favorable halibut bottom is found in many small patches. Between Grays Harbor and Flattery Bank these patches are more numerous than in the region south of the Columbia River. South of Tillamook Bay there are very few spots of good bottom. These patches do not hold the schools of fish for any length of time, and the largest of them can be cleared of halibut in a few trips by the fishing fleet.

In the region under consideration the schools of halibut appear to arrive at the banks from a westerly or northwesterly direction, and this, taken into consideration with the rumors of shoal water offshore, would seem to indicate the possible presence of banks farther out to sea than any now known. The discovery of Gibson Bank would seem to lend support to such a belief. It is desirable that a thorough survey be made.

Black cod occur in great numbers along the coast of Washington and should support a large fishery if a demand can be created for this species. Rock cod should also be marketed. Dogfish occur in large numbers and might be utilized as fertilizer. The smaller flatfishes, flounders, sole, sand dab, etc., are also found in great abundance.

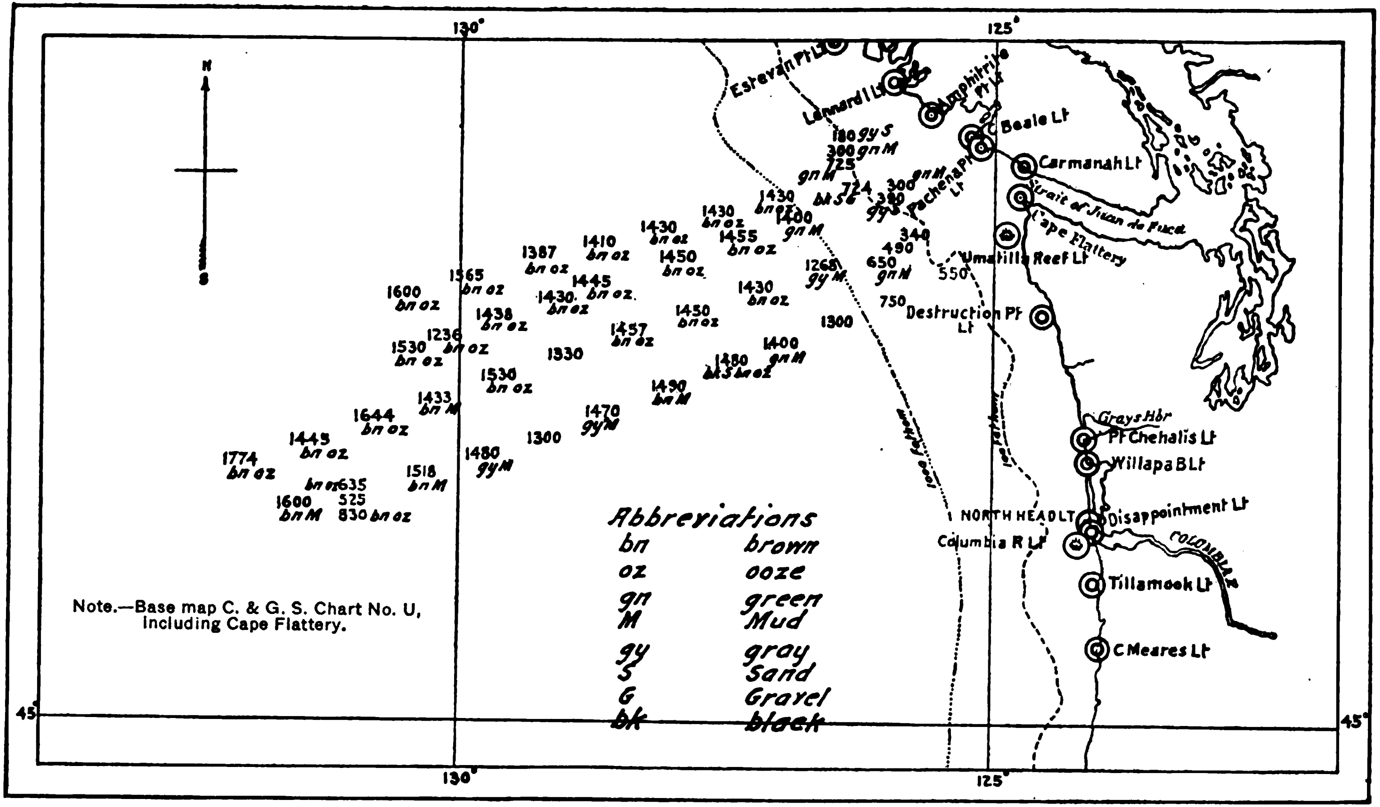
EXPLANATION OF CHARTS.

The charts accompanying this report are sections of those issued by the Coast and Geodetic Survey, to which have been added all the soundings made by the steamer *Albatross* in the years 1914 and 1915. Near the figures representing the depths obtained, and near many of those contained in the original chart, have been entered the bottom characterizations for that locality. The positions of these soundings are accurate, as in most of the cases at the time of sounding land was in sight from which bearings could be secured. All doubtful figures have been discarded.

As little or no fishing is done inside the 30-fathom curve, the depths and bottom characterizations have been omitted from between that curve and the shore. The 10, 20, 30, 50, and 100 fathom contour lines are included after being changed to conform with the soundings made in this investigation. The lighthouses and other positions on shore from which bearings were taken have been indicated.

Areas of bottom favorable for halibut are inclosed by heavy dashes and numbered with Roman numerals. Tables 1 and 2 contain the information pertaining to these areas. The character ∸ means that no bottom was found at the depth indicated. A table for abbreviations used is shown on each chart.

Chart 1.



Note.—Base map C. & G. S. Chart No. U, Including Cape Flattery.

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